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Sources of Toxic Pollutants Found in Influents to Sewage Treatment Plants
IV. R. M. Clayton Drainage Basin
Atlanta, Georgia

(U.S.) Environmental Protection Agency
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P. Levins, J. Adams, P. Brenner, S. Coons, and K. Thrun.

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This report represents the third in a series of studies of drainage basins undertaken to determine the relative importance of major sources of pollutants found at the influent of publicly-owned treatment works (POTWs). The general categories of residential, commercial, aand industrial have been identified as appropriate classifications for this study. This drainage basin provided the opportunity to sample a larger fraction of commercial activity, including an entire downtown area, and had the largest and most chemically intensive industrial areas studied to data.

KEYWORDS: *Waste water, *Water pollution, *R, *Sewage treatment, *Commerical buildings, *Industrial wastes, *Water pollution sampling, *Water pollution detection.

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SPRINGFIELD, VA. 22161

SOURCES OF TOXIC POLLUTANTS FOUND IN INFLUENTS TO SEWAGE TREATMENT PLANTS

IV. R.M. CLAYTON DRAINAGE BASIN, ATLANTA, GEORGIA

Final Report On
Task Order No. 10
EPA Contract No. 68-01-3857

by
P. Levins, J. Adams, P. Brenner, S. Coons, K. Thrun, J. Varone

Prepared For
U.S. Environmental Protection Agency
Office of Water Planning and Standards
Monitoring and Data Support Division
Washington, D.C.

October, 1979

i.a

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We wish particularly to thank the large number of Arthur D. Little, Inc. staff members who participated in the sampling and analysis team efforts. Their commitment to the program and their extra hours effort helped make the study a success. The willing cooperation of the corporate facilities staff also helped considerably with the intense start-up effort required for this study.

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I. SUMMARY

This report represents the third in a series of studies of drainage basins undertaken to determine the relative importance of major sources of pollutants found at the influent of publicly-owned treatment works (POTWs). The general categories of residential, commercial, and industrial have been identified as appropriate classifications for this study. This is the fourth report in the series -- the three previous reports (with the same overall title as this report) have been published under the subtitles listed below:

Part I: Literature Review[3]

Part II: Muddy Creek Drainage Basin, Cincinnati, Ohio[4]

Part III: Coldwater Creek Drainage Basin, St. Louis, Missouri[5]

This third study was carried out in the drainage basin of the R. M. Clayton treatment plant, Atlanta, Georgia. This drainage basin provided the opportunity to sample a larger fraction of commercial activity, including an entire downtown area, and had the largest and most chemically intensive industrial areas studied to date. The relative flow from the source types in the basin was:

Residential: 61%
Commercial: 21%
Industrial: 18%

The impact of the industrial activity in this area is clearly observed in the POTW influent mass loading. The industrial sources dominate most pollutants in this basin especially chlorinated organic solvents, some aromatic hydrocarbons and most metals. Samples (48-hour composites) were collected from two residential, three industrial, four commercial sites (including two downtown areas), tap water, and POTW influent.

The quality control program used in the previous cities was retained for this city. A total of 34 samples, including two field blanks, were collected for analysis. Samples were analyzed for all priority pollutants (excluding asbestos) plus manganese, the classical parameters of ammonia, TSS, TOC, BOD, COD, and oil and grease, as well as pH and temperature.

A detailed discussion of the results may be found in Section VI of this report; some of the observations are summarized here. In the R. M. Clayton drainage basin, 49 priority pollutants were observed: 35 organics, 11 metals plus manganese, total cyanides and total phenols. The six classical parameters measured in this study - ammonia, TSS, TOC, COD, BOD, and oil and grease - were also detected. Eight organics, seven metals, and total phenols were observed more than 50% of the time (16 samples); five of the metals were observed 100% of the time. Two organic pollutants - chloroform and 1,1,2,2-tetrachloroethylene - were detected in 90-100% of the samples, as they were in St. Louis.

There were five volatile priority pollutants (vinyl chloride, chloroethane, trichlorofluoromethane, acrylonitrile, 1,1,2-trichloroethane) observed in Atlanta for the first time in this study. This is due to the more industrial nature of the sources, as well as to slight improvements in the analytical procedures for the gases. There were 77 priority pollutants (including all the pesticides) which were not detected in any of the samples.

The areas sampled in Atlanta included more industrial activity than the previous studies as well as an entire downtown area. The large and complex downtown site turned out to have pollutant levels comparable to the other commercial averages and the residential values.

The concentration levels for the industrial sites are the highest seen to date in these studies and are clearly reflected in higher influent mass loads than seen previously. Most priority pollutants are observed at their highest levels in the industrial sites; trichloroethylene is highest in the downtown area; chloroform, pentachlorophenol and silver are at comparable levels in the downtown, commercial, and industrial sites.

Of the 33 priority pollutants for which a mass balance analysis was carried out, 17 priority pollutants project a total loading which is equivalent to the measured POTW influent (within a factor of two), including nine organics, total phenols, and seven metals. Influent levels of four of the classical parameters are also accounted for by the sources. Five pollutants have projected source levels which are less than the influent and these are all organic chlorinated solvents. Five priority pollutants (two organics, two metals and total cyanides), COD, and oil and grease have projected source values greater than observed in the influent.

When compared with the sum (Kg/day) of all the scaled-up sources, 29 pollutant loads appear to be due primarily (more than 50% of the mass) to industrial sources; only trichloroethylene may be attributed mainly to commercial sources. Manganese, ammonia, and COD are dominated by the residential sources.

The chemical analysis procedures have been improved for some pollutants. The internal standard procedure for acid and base/neutral analyses was changed; the d_{10}-anthracene was added to the concentrated extracts, and four additional standards were added to the samples prior to preparation as a monitor of total method recoveries. The purge and trap method for analyzing the volatiles was modified by the addition of charcoal to the sorbent trap; chloromethane, bromomethane, and vinyl chloride were able to be measured in the QC samples whereas they were not recovered in the previous surveys. The pesticide procedure was also expanded by using a third GC column to corroborate the preliminary identifications.

The quality control program continues to be invaluable in providing daily checks on the chemical analyses and in establishing the reliability of the data used for subsequent calculations and projections. Most recovery values for the QC samples are in the 70% to 100% range, and the precision is about 10% to 30%.

In Atlanta, one sample of the POTW influent was analyzed to determine what, other than the list of priority pollutants, were present. The major chemical classes identified include paraffins, phthalates, alkylated polynuclear aromatic hydrocarbons, alkylated phenols, fatty acids and esters. These compounds and approximate concentration levels are presented in Section V.

The selection and isolation of sampling areas containing only one type of source activity, i.e., residential, commercial or industrial, continues to be problematic. The collection system bears little resemblance to the surface zoning and the system maps frequently are not complete relative to direction of flow and location of manholes. A great deal of site preparation must be put into accurately locating areas whose land use is satisfactory for source type characterization.

II. INTRODUCTION

It is the concern of the Office of Water Planning and Standards (OWPS) to develop a comprehensive strategy governing the toxic substances introduced into, and subsequently passing through, the publicly-owned sewage treatment works (POTWs). In order to supply the necessary basis for formulating guidelines, the Monitoring and Data Support Division (MDSD) has sponsored this study of cities across the country. In addition to assessing the extent to which priority pollutants may enter the environment via the POTWs, this POTW program is concerned with determining the sources of those pollutants. The objectives of the POTW source survey include defining the various types of source categories, describing those categories in terms of priority pollutant contributions, and determining the relationship of the individual source measurements to the pollutant burden at the POTW influent.

By using the data to calculate a set of pollutant specific indices corresponding to the residential, commercial and, to a lesser extent, industrial sources for each of the cities sampled, it is hoped that a general characterization of the pollutant load attributable to these categories can be made. The sources of the pollutants measured in the POTW influent of previously unsampled treatment basins may be estimated in such a way as to suggest valid routes to limit pollutant loads.

The sampling and analysis procedures employed in the POTW surveys are those outlined in the EPA Screening Protocol for Priority Pollutants[1] and the EPA Quality Assurance Program.[2] The first three phases of the program encompass the literature study of existing information on wastewater treatment and pollutant levels,[3] and the initial two studies which were conducted at the Muddy Creek Drainage Basin in Cincinnati,[4] and the Coldwater Creek Drainage Basin in St. Louis.[5] A quality control program was established as part of the initial study and the data from the following surveys have been shown to be in control with respect to the established standards. This report documents the survey conducted at the R. M. Clayton Drainage Basin in Atlanta. The procedures employed for the sampling and chemical analysis were generally the same as those used in the previous studies. Any modification in analytical procedures, as well as the results of the QC program, are detailed in Section V.

The area served by the R. M. Clayton POTW is, for the most part, of a more industrial nature than the Muddy Creek area in Cincinnati or the Coldwater Creek area in St. Louis. This basin, therefore, provided the opportunity to sample a large number of industrial sites in addition to the residential and commercial sites. The three sites chosen as representative of the industrial activity in the basin include manufacturing, construction, transportation and wholesale establishments. Samples were collected every four hours at a total of eight (8) locations in addition to the POTW influent and the tap water source. Three 48-hour flow-composited samples were produced from these samples for each site. Descriptions of the individual sampling areas, with respect to their residential, commercial, and industrial components, are given in Section III.

This report is restricted to a presentation and discussion of the Atlanta study. Since this is the third drainage basin to be sampled in the series, there has been a large amount of data generated on the pollutants and possible sources of contamination. The data from this survey at the R. M. Clayton drainage basin will be combined with the data from the other surveys, in a final overall report, in order to be able to predict the levels and sources of pollutants found at a POTW serving a "typical" drainage basin. The results of this study have been analyzed in various ways and are presented in Section VI.

The frequency of occurrence of a particular priority pollutant at the individual sampling locations has been established from the concentration data. The concentration data have also been used, as in the St. Louis survey, to develop indices by which the mass load resulting from residential, commercial, or industrial activities could be determined for each pollutant. These indices were calculated on a mass per capita basis for the residential sources and on a concentration basis for the commercial and industrial sources. In this way, the individual measurements could be scaled up to estimate the total pollutant load at the POTW influent.

Each basin surveyed provides an enormous amount of new information. In addition to supplying data on a third POTW treatment area, this survey at the R. M. Clayton basin in Atlanta has served as a measure against which to compare and verify the quality control program as well as a means for testing some of the conclusions that were made based on the previously available data. Being more industrial in nature, the sources sampled in Atlanta shed some light on types of problems encountered in attempting to predict a typical industrial contribution to the pollutant load.

III. R. M. CLAYTON POTW TREATMENT AREA

A. Introduction

The R. M. Clayton Drainage Basin was chosen for the third source sampling study on the basis of the following criteria:

1. Cooperation of the Bureau of Pollution Control, Atlanta, and other local agencies.
2. Identification of highly concentrated zones of industrial, commercial and residential (both new and old) activity.
3. Geographical location of the study to be in the southeast portion of the United States.
4. Determination of safe and accessible sampling points.

Arthur D. Little staff first visited the Clayton treatment plant and toured an area extending north and south from the Clayton plant and within the city limits of Atlanta. Arthur D. Little staff met with the following personnel to obtain information on logistics, space, land use and sewer maps, survey crews, water billing accounts, etc.:

Mr. George Barnes	Director of the Bureau of Pollution Control, City of Atlanta
Mr. William Burdett	Director, Division of Inspection & Monitoring, City of Atlanta (former)
Mr. Robert Hadden	Director, Division of Inspection & Monitoring, City of Atlanta
Mr. Robert Alford	Supervisor of Design & Engineering; Senior Engineer, DeKalb County Water and Sewer Department

Unlike the two previous sampling efforts in St. Louis and Cincinnati, the Clayton drainage basin is not under the jurisdiction of a single metropolitan sewer district. Four authorities each have partial control over the basin. Therefore, the acquisition of maps and assistance of

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survey crews were handled individually with each sewer authority. The following authorities were contacted: the City of Atlanta, DeKalb County Water and Sewer Department, Fulton County Department of Public Works, Gwinett County Department of Public Works. A number of planning agencies in Atlanta and DeKalb County were also visited to gain information on the characteristics of the areas to be sampled within the R. M. Clayton Basin.

Most of the demographic data was obtained from the Atlanta Regional Commission (ARC) in the City of Atlanta. Data files covered all areas investigated in our POTW program including the City of Atlanta, DeKalb County and Fulton County. A number of land-use maps, reports on population, housing, employment, area-wide wastewater management plan, etc., were obtained. However, the four-digit SIC codes for industrial and commercial establishments were not available due to the confidentiality of the data files.

In order to establish the land use and planning information available in DeKalb County, the staff at the DeKalb County Planning Department were consulted. A great deal of information was obtained from the Division Chief of the Property and Mapping Division who is responsible for the industrial and commercial areas in DeKalb County. They provided detailed maps with lot counts in the area along with sheets indicating SIC codes, addresses, lot numbers, and brief descriptions of each industry or commercial area.

Other visits to obtain demographic data included the DeKalb County Water and Sewer Department; City of Atlanta, Bureau of Planning; Department of Environment and Streets, City of Atlanta; City of Atlanta Water Bureau.

From the above sources, the following demographic data were summarized for each sampling site location.

Housing--Number of single family units, number of units in structures of less than 10 units, number of units in structures of more than 10 units from the 1970 census data.

Population--Population data were estimated by the following procedure. First, for the entire POTW area, census data were used to estimate on a block by block basis the population in the treatment area. The

1970 population was adjusted to a 1978 value on the basis of a population survey done by the Atlanta Regional Commission, "1978 Population and Housing," October 1978. For each sampling site a similar process was used. First, we obtained the 1970 census by comparing census block areas to sampling areas and adjusting for the population in those blocks not entirely included in a sampling site. Second, 1970 data were adjusted to 1978 by multiplying the 1970 data by the ratio of 1978 tract based population divided by 1970 tract based population for that census tract(s) that correspond to the sampling site. Thus for all of these cases we have estimated to 1978.

Employment--Employment by major industry (SIC codes) groups for 1970 and 1975, total employment for each site and whole POTW area, total percent change, total number of firms (1975) in each site and whole POTW area.

Industry--For DeKalb County sampling areas only, we have a breakdown by SIC code (4 digits) of all industry, commerce, services and public establishments. For all other sampling areas and total POTW area, we have the total number of firms for each (1975).

In the following sections we describe the R. M. Clayton POTW area, the Clayton treatment plant, and then each sampling area. Details of the sampling plan are presented in Section IV.

B. R. M. Clayton POTW

The R. M. Clayton plant is the largest wastewater plant in the Atlanta metropolitan area. It has a capacity to treat up to 120 million gallons a day of wastewater and is currently treating 80 million gallons daily.

Four local authorities have jurisdiction over the plant and/or drainage basin:

City of Atlanta--plant and about 40 sq. miles of drainage area
Fulton County--approximately 20 sq miles of drainage area
Gwinett County--approximately 10 sq. miles of drainage area
DeKalb County--approximately 60 sq. miles of drainage area

Slightly more than half of DeKalb County's sewage--30 to 35 million gallons a day--is treated at the R. M. Clayton plant. After treatment, effluent from the Clayton plant flows into the Chattahoochee River.

C. General Description of POTW Area

The basin covers approximately 130-140 square miles, extending from the northwestern corner of the City of Atlanta (where Marietta Boulevard crosses the Chattahoochee River) northwards to about I-285. From here it goes eastward to approximately the boundary of DeKalb and Gwinett Counties, and southward to the intersection of Rt 10 and I-285. Going westwards, the basin follows Rt 10 through the center of downtown Atlanta and then northwesterly along Marietta Boulevard. Figure 1 outlines the overall treatment area and shows the location of the sampling areas. Figure 2 displays the land use within the treatment area with respect to the residential, commercial, industrial and open spaces.

Population for the area for 1978 is estimated to be 385,425. There are approximately 76,272 single family units, 28,882 units in structures of 10+ units and 34,136 units in structures of less than 10 units. See Table 1 for a summary of population and housing estimates for each sampling area and the POTW area. There are approximately 10,630 firms in the entire R.M. Clayton basin (1975 data). Table 2 summarizes employment by major industry groups for each sampling area and the entire basin. The two-digit codes given in the table encompass all the individual classifications beginning with those two numbers, e.g., 15-17 includes 1500 through 1799.

D. Overall Description of Sampling Sites Within the R. M. Clayton Treatment Area

As mentioned above, Figure 1 shows the treatment area and location of each sampling area. Table 3 lists the locations, sewer characteristics and general land use designation of sampling areas. Land use maps for each sampling area have also been included.

1. DeKalb

The DeKalb sampling area is located in the municipality of Doraville in DeKalb County, northeast of the City of Atlanta and just north of the DeKalb Peachtree Airport. Figure 3 shows the streets, sampling location, and land use for the DeKalb sampling area.

The DeKalb sampling area is characterized as a commercial area. Total number of firms in 1975 was 66 for a total employment of 1,161 compared to 838 in 1970 (for an increase in employment of 38.5%). Total

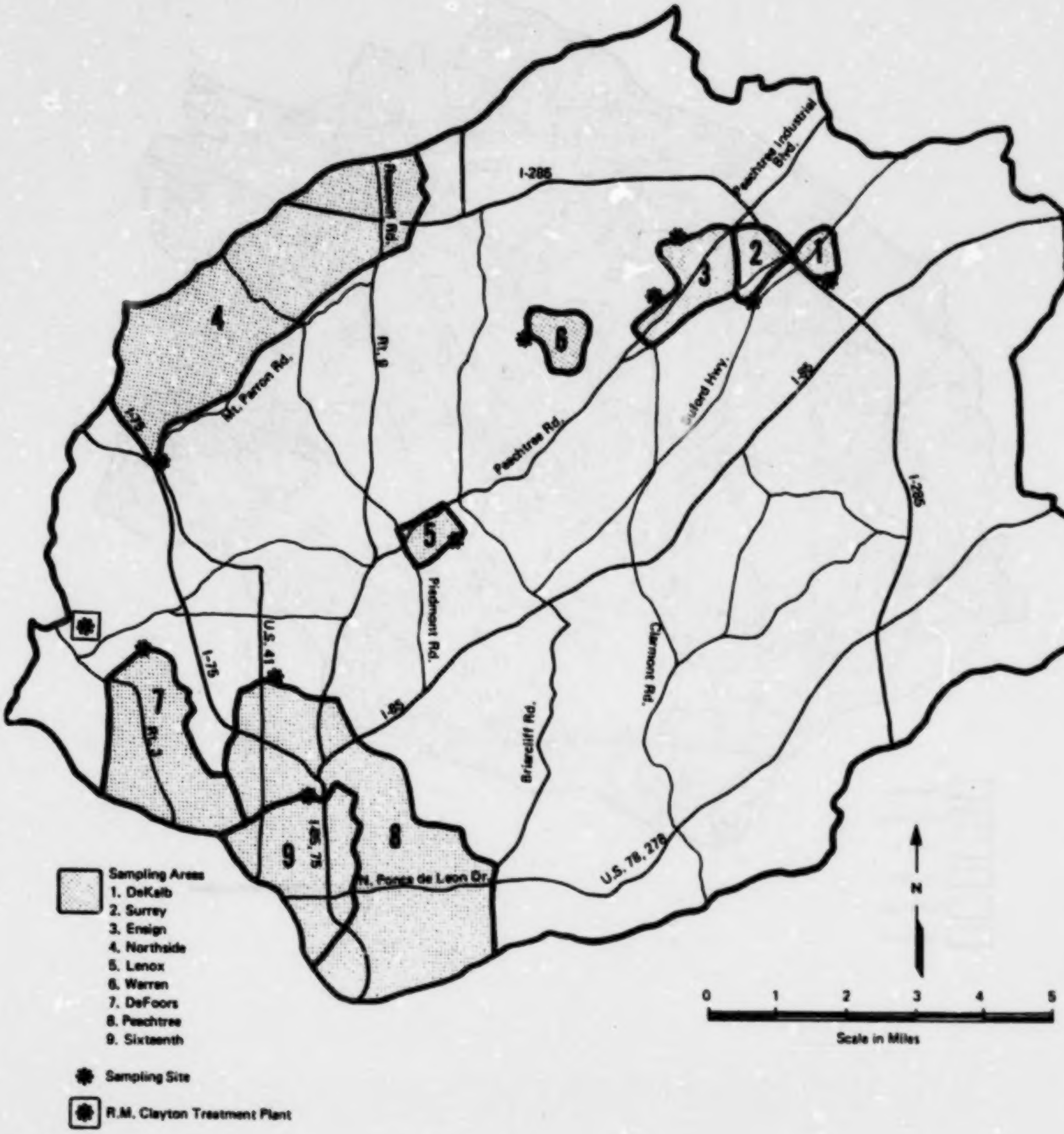
I-285
Peachtree Industrial Blvd.
Roswell Rd.
Mt. Paran Rd.
Rt. 9
I-75
Peachtree Rd.
Buford Hwy.
I-85
I-285
Piedmont Rd.
U.S. 41
Rt. 3
Briarcliff Rd.
Clairmont Rd.
I-85
I-85, 75
N. Ponce de Leon Dr.
U.S. 78, 278
1
2
3
4
5
6
7
8
9
N
0
1
2
3
4
5
Scale in Miles
Sampling Areas
1. DeKalb
2. Surrey
3. Ensign
4. Northside
5. Lenox
6. Warren
7. DeFoors
8. Peachtree
9. Sixteenth
Sampling Site
R.M. Clayton Treatment Plant

FIGURE 1 R.M. CLAYTON TREATMENT AREA

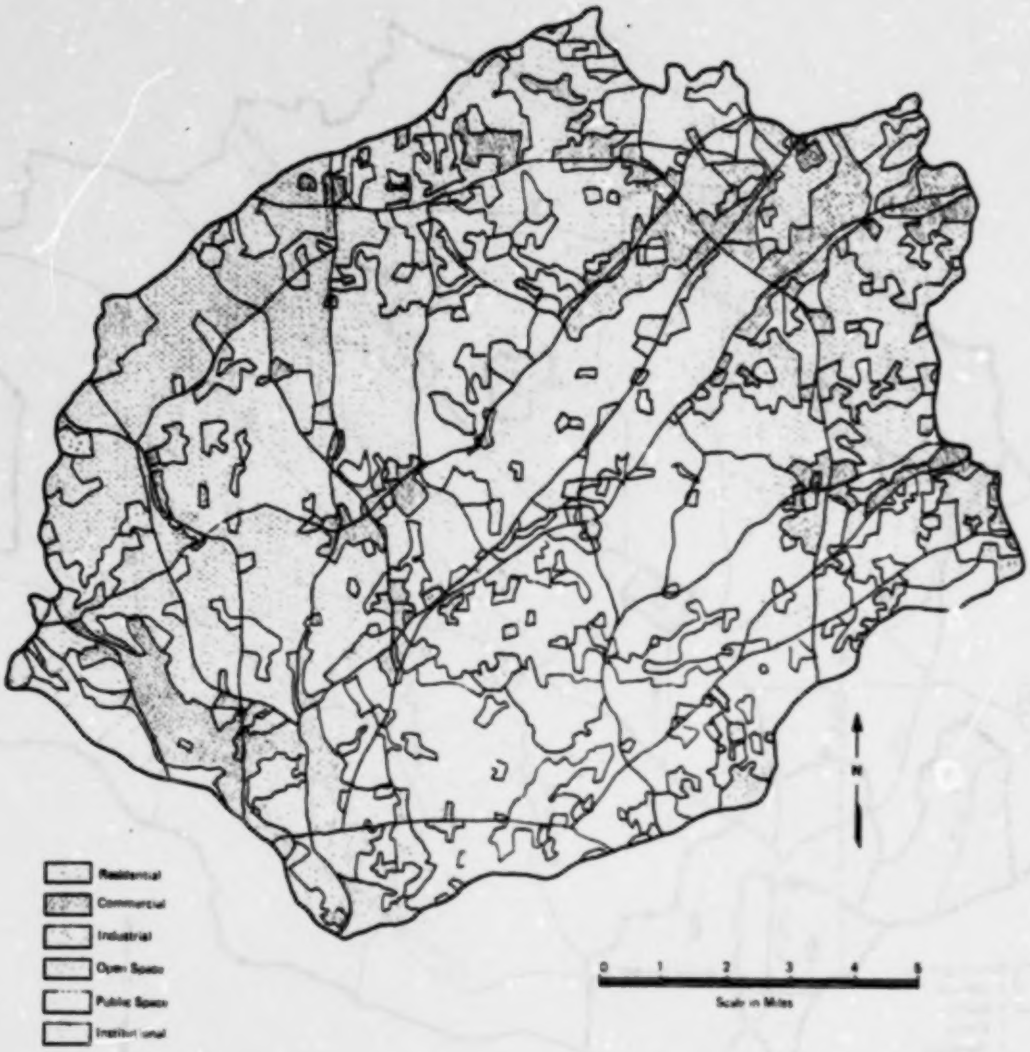
Residential
Commercial
Industrial
Open Space
Public Space
Institutional
0
1
2
3
4
5
Scale in Miles
N

FIGURE 2 R.M. CLAYTON TREATMENT AREA—LAND USE

Table 1

POPULATION AND HOUSING SUMMARY

Sampling Location	POPULATION		HOUSING				
			1970 Census Data			1978 Estimates**	
	1970 Census	1978 Est.*	# units in structures of 10+ units	# units in structures of less than 10 units	Single-Family	Apart-ment units	Duplex units
Ensign	3,399	3,533	74	0	498	294	0
DeKalb	1,430	1,868	86	109	178	205	0
Surrey	423	500***	81	57	35	184	4
Northside	9,616	10,280	1,456	568	2,176		
Lenox	1,907	1,852	52	44	293		
Warren	2,631	2,416	1	21	521		
DeFoors	1,992	1,951	39	171	425		
Peachtree	60,003	52,426	11,362	10,162	6,379		
Sixteenth	13,189	12,810	2,239	1,131	958		
Entire POTW (R.M. Clayton)	379,188	385,427	28,882	34,136	76,272		

*Estimates from "1978 Population and Housing" by Atlanta Regional Commission, Oct. 1978

**1978 data for DeKalb County from Planning Department, Property and Mapping Div., Decatur, Ga.

***Estimate based on 3.2 persons per single family unit and 2.2 for other units; values obtained from the 1970 census.

Table 2

EMPLOYMENT BY MAJOR INDUSTRY GROUPS

(SIC Code Class.)

Location	Year	01-09 Agric/ Fores	10-14 Mining	15-17 Construc	20-39 Manuf	40-49 Trans/ Comm	50-51 Whole-Sale Trade	52-59 Retail	60-67 Fin, Ins,R.E.	70-89 Services	91-97 Public Admin	Total Employ-ment	Total % Change	Total Number of Firms
DeKalb	1970	0	0	36	0	0	9	729	28	36	0	838		NA
	1975	0	0	4	8	0	10	961	45	133	0	1,161	38.5	66
	1978													105
Ensign	1970	8	22	441	1070	404	2262	885	203	532	251	6,078		NA
	1975	10	32	634	1225	396	2440	1293	371	982	285	7,698	26.7	387
	1978													449
Surrey	1970	0	0	62	3560	204	152	55	11	85	105	4,234		NA
	1975	2	0	80	4316	[illegible]	1074	194	29	198	131	6,261	47.9	74
	1978													116
Northside	1970	33	1	134	10	55	114	686	445	400	205	2,083		NA
	1975	42	0	103	100	58	482	1895	1583	1170	192	5,625	170.0%	259
Lenox	1970	4	2	67	836	31	519	3200	218	465	5	5,347		
	1975	4	0	37	343	289	565	2897	320	1016	11	5,482	2.5	79
Warren	1970	0	0	2	0	0	0	0	4	0	11	17		
	1975	0	0	11	0	0	0	0	2	0	9	22	29.4	3
DeFoors	1970	23	0	554	4262	2145	3741	461	58	1872	933	14,049		
	1975	18	0	939	3865	3339	4222	502	48	1643	864	15,440	9.9	386
Peachtree	1970	119	158	4146	13652	11317	8735	19265	23271	38549	18204	137,616		
	1975	58	13	3435	10880	7707	9364	15583	22262	38276	27215	134,793	-2.1	2835
Sixteenth	1970	51	94	1366	3973	1692	3732	4589	5484	12750	4816	38,547		
	1975	11	0	755	3662	1754	2883	2894	2894	11022	7743	35,058	-9.1	637
R.M. Clayton Basin	1970	651	212	12641	42746	18095	33623	46877	34605	65407	34485	289,342		
	1975	820	67	12709	36655	18231	38459	49809	40889	81220	48981	327,840	13.3	10,630

Source: Atlanta Regional Commission

Table 3
SAMPLING SITE LOCATIONS AND CHARACTERISTICS

Code Name	Source Type/Sewer Type	Location (Longitude:Latitude)	Sewer Characteristics
Northside	New residential/sanitary	84° 25' 52.2" 33° 51' 15.9"	24" 0.2% slope
Warren	Old residential/sanitary	84° 20' 38.7" 33° 53' 27.1"	10" 0.5% slope
Lenox	Commercial/sanitary	84° 21' 34.4" 33° 50' 31.2"	10" 2.4% slope
DeKalb	Commercial/sanitary	84° 16' 11.0" 33° 54' 8.1"	10" 3.2% slope
Peachtree	Mixed/combined	84° 24' 20.1" 33° 48' 56.3"	5'6" x 5' rectangular 0.13% slope
Sixteenth	Commercial/combined	84° 23' 32.7" 33° 47' 23.5"	12' semi-circular 0.34% slope
Ensign	Industrial/sanitary	84° 18' 43.7" 33° 54' 19.6"	12" 1.83% slope
Sexton Woods	Industrial/sanitary	84° 18' 43.7" 33° 53' 38.8"	12" 1.3% slope
Surrey	Industrial/sanitary	84° 17' 24.4" 33° 53' 37.8"	15" 15.9% slope
DeFoors	Industrial/sanitary	84° 26' 13.2" 33° 49' 15.9"	30" 0.2% slope

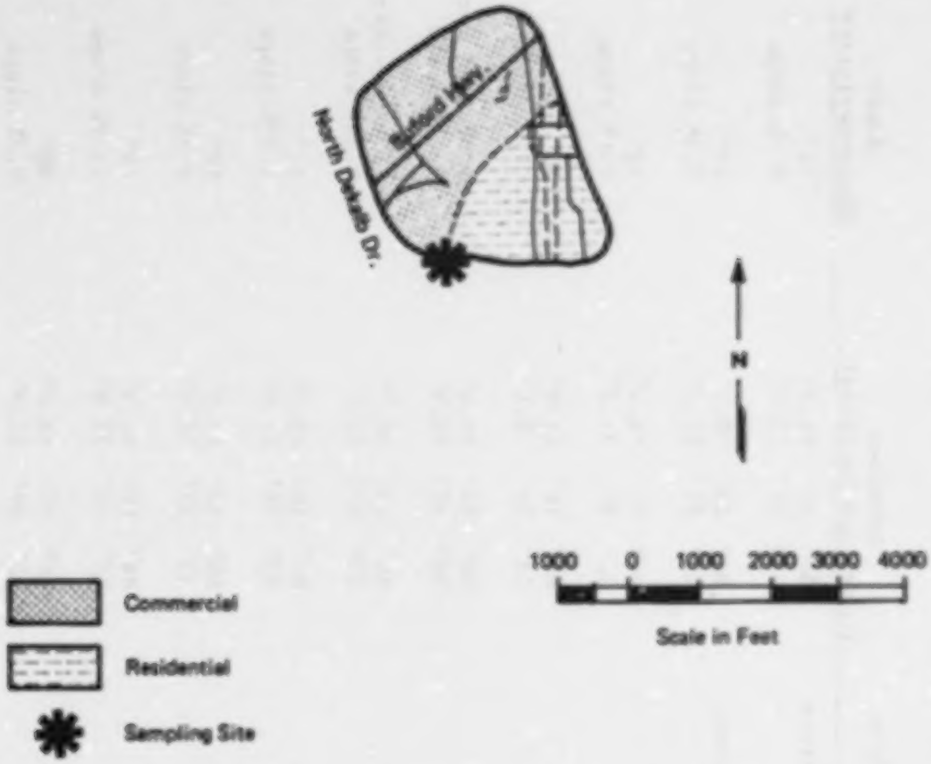
Buford Hwy.
North Dekalb Dr.
N
1000 0 1000 2000 3000 4000
Scale in Feet
Commercial
Residential
Sampling Site

FIGURE 3 DEKALB-LAND USE AND STREETS

number of firms in 1978 was 105. There are approximately 56 commercial/retail establishments, 14 banking/real estate establishments, 3 office buildings (37 units), 25 service establishments, 3 health services, and 3 religious organizations. Population for this area according to 1970 census data was 1,430 compared to the 1978 estimate of 1,868. Single family residences total 178 (1970 census) and there are 3 apartment complexes totaling 205 units (1978 data).

2. Surrey

The Surrey sampling area is located in the municipality of Doraville in DeKalb County adjacent to the DeKalb and Ensign sampling areas. Figure 4 shows the streets, sampling location, and land use for the Surrey sampling area.

The Surrey sampling area is characterized as an industrial area. The total number of firms in the area number 116 in 1978 compared to 74 in 1975. Total employment in 1970 was 4,234 and in 1975 was 6,261 (for an increase of 47.9%). As shown in Table 2, the highest employment figure occurs in industry with SIC classification of 20-30 (manufacturing); categories 50-51 (wholesale trade) also account for a large percentage of the employment in this area. Population for this area according to 1970 census data was only 423 compared to an estimate of 500 in 1978. There are only approximately 35 single family homes but there are two large apartment complexes totaling 184 units, and only two duplex homes.

3. Ensign

The Ensign sampling area is located in the municipalities of Doraville and Chamblee in DeKalb County adjacent to the Surrey sampling area. Figure 5 shows the streets, sampling location, and land use for the Ensign sampling area.

The Ensign sampling area is characterized as an industrial area. The largest types of industrial activity are manufacturing and wholesale trade. Peachtree Industrial Boulevard (Rt 141) runs through the middle of the sampling area and defines a commercial strip including some light industry, as well as more heavily industrial areas. There is a small

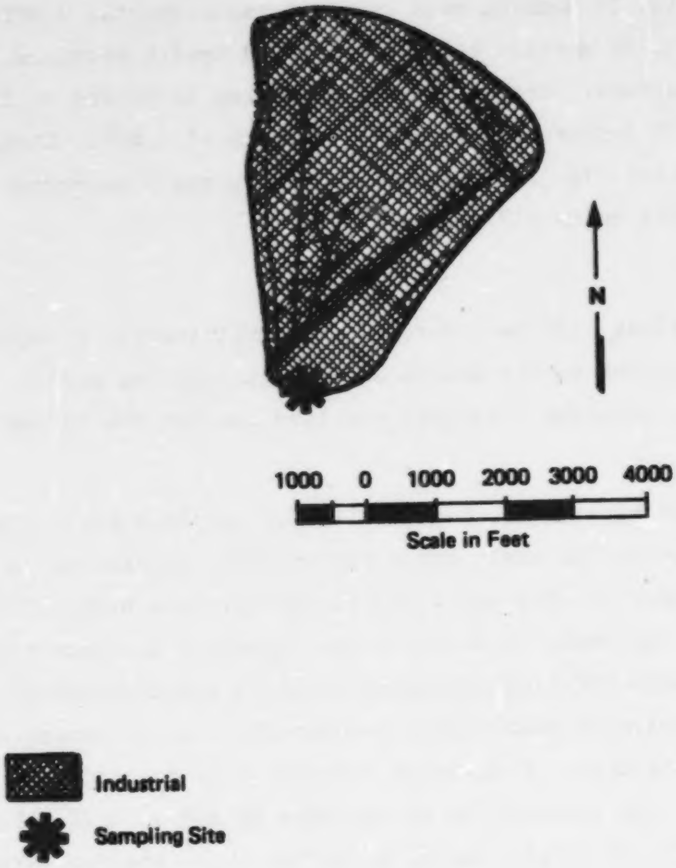
N
1000
0
1000
2000
3000
4000
Scale in Feet
Industrial
Sampling Site

FIGURE 4 SURREY-LAND USE AND STREETS

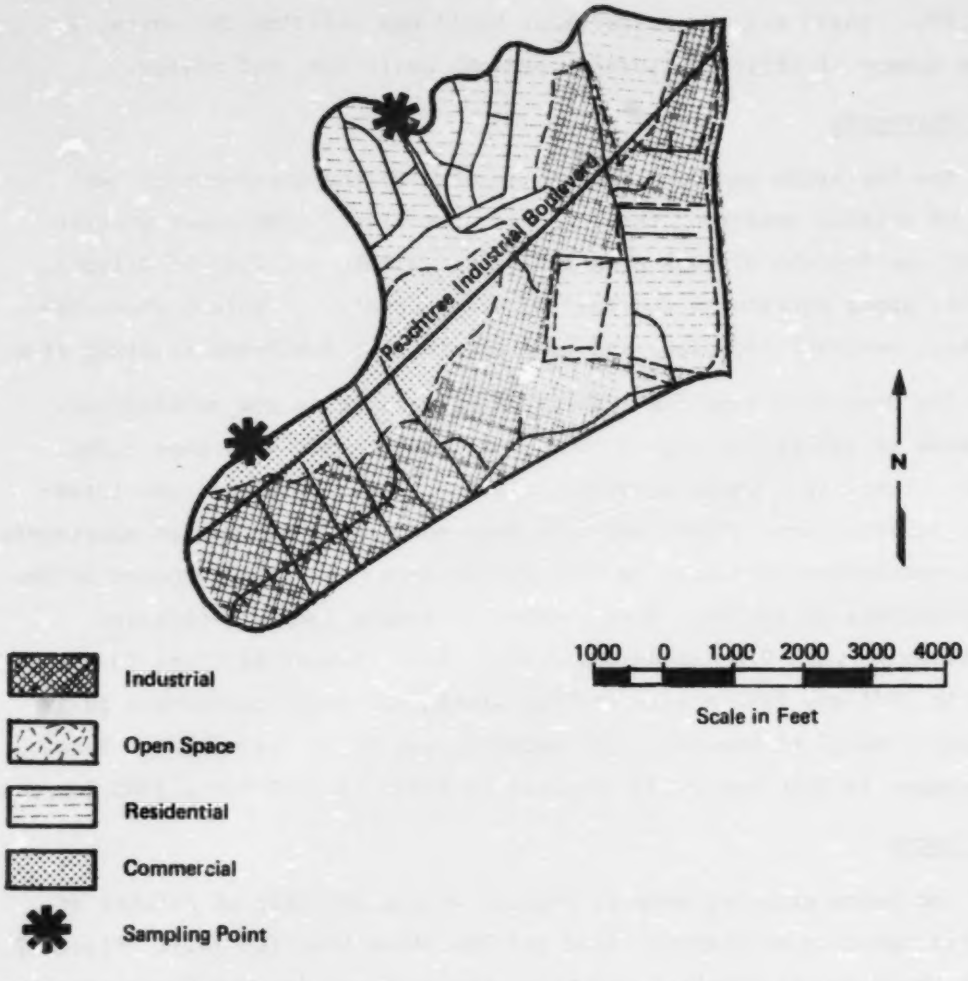
Peachtree Industrial Boulevard
N
1000
0
1000
2000
3000
4000
Scale in Feet
Industrial
Open Space
Residential
Commercial
Sampling Point

FIGURE 5 ENSIGN-LAND USE AND STREETS

residential section to the west of the sampling area. Total number of firms in 1975 was 387 compared to the 1978 estimate of 449. Total employment for the area was 6,078 according to 1970 census data and 7,698 in 1978 (for an increase in employment of 26.7%). Population according to 1970 census data was 3,399 compared to an estimated 3,533 for 1978. There are seven apartment buildings totaling 294 units, a large number of office buildings, medical buildings, and plazas.

4. Northside

The Northside sampling area is located to the northwest of the City of Atlanta bordering the Chattahoochee River. The lower portion (about one-fourth) of this area is located within the City of Atlanta, and the upper portion is located in Fulton County. Figure 6 shows the streets, sampling location, and land use for the Northside sampling area.

The Northside sampling area is characterized as new residential. The area is relatively high income, mostly new homes with some older areas. There is a small commercial area on Roswell Road at the interstate intersection. There are also some medium-density garden apartments. Total population according to 1970 census data was 9,616 compared to the 1978 estimate of 10,280. Total number of single family residences according to the 1970 census was 2,176. Total number of firms in this area in 1975 was 259, mostly falling within SIC major categories 52-59 (retail), 60-67 (insurance, real estate), and 70-80 (services). Total employment in 1970 was 2,083 compared to 5,625 in 1975 for a 170% increase.

5. Lenox

The Lenox sampling area is located within the City of Atlanta at the intersection of Piedmont Road and Peachtree Road (Rt 141). Figure 7 shows the streets, sampling location, and land use for the Lenox sampling area.

The Lenox sampling area is characterized as a commercial area. The area consists mainly of the Lenox Square shopping center but also includes some strip commercial activity and a small amount of desirable housing. There is, however, a residential area that is "under pressure" for

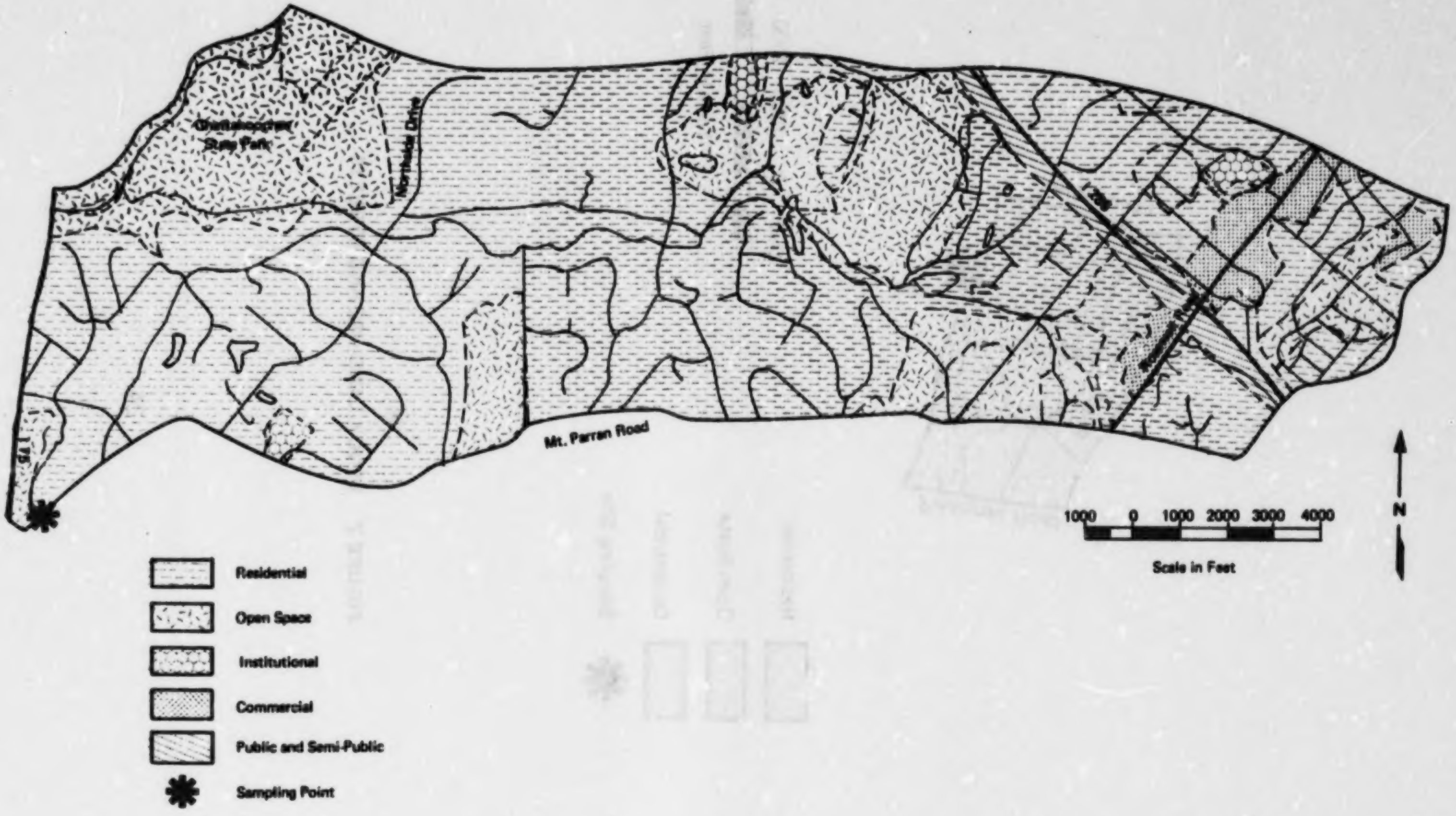
Chattahoochee State Park
Northside Drive
Mt. Parran Road
I 285
Roswell Road
I 75
1000 0 1000 2000 3000 4000
Scale in Feet
N
Residential
Open Space
Institutional
Commercial
Public and Semi-Public
Sampling Point

FIGURE 6 NORTHSIDE—LAND USE AND STREETS

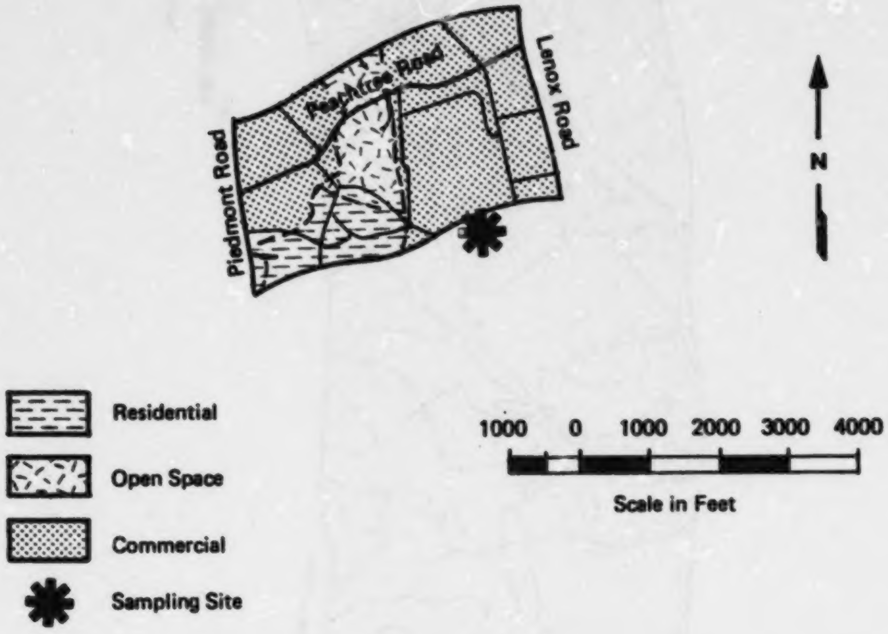
Peachtree Road
Lenox Road
Piedmont Road
N
Residential
Open Space
Commercial
Sampling Site
1000
0
1000
2000
3000
4000
Scale in Feet

FIGURE 7 LENOX-LAND USE AND STREETS

commercialization. The single family 1970 census data count was 293 for this area with a population of 1,907. The 1978 estimate shows a decrease in population to 1,852. Total number of firms in 1975 was 79 with an employment figure of 5,482 (1970 estimate was 5,347 for only a 2.5% increase from 1970 to 1975). The largest employment number was in the SIC code categories 52-59 (retail), with the next highest occurring in categories 70-89 (services).

6. Warren

The Warren sampling area is located north of the City of Atlanta in DeKalb County. Figure 8 shows the streets, sampling location, and land use for the Warren sampling area.

The Warren sampling area is characterized as an old residential area. The homes are in the higher price range and are approximately 20-25 years old. Total number of single family homes according to 1970 census data was 521 with a population of 2,621. The 1978 estimate shows a decrease in population to 2,416.

7. DeFoors

The DeFoors sampling area is located in the City of Atlanta to the northwest of Georgia Tech with Marietta Boulevard and Chattahoochee Avenue running through the middle of the sampling area. Figure 9 shows the streets, sampling location, and land use for the DeFoors sampling area.

The DeFoors sampling area is characterized as an industrial area. As shown in Table 2, the largest employment in the area is in SIC major categories 20-39 (manufacturing), 50-51 (wholesale trade), and 40-49 (transportation). It is primarily a warehousing and light industrial area with very little heavy manufacturing. There is some residential area on the northeast side; it is relatively low income. There are a number of railroad yards and commercial areas such as fastfood restaurants, service stations, etc., along Marietta Boulevard. Total number of firms in the area is 386 with a total employment figure of 15,440 in 1975 compared to 14,049 in 1970 for a 9.9% increase in employment. According

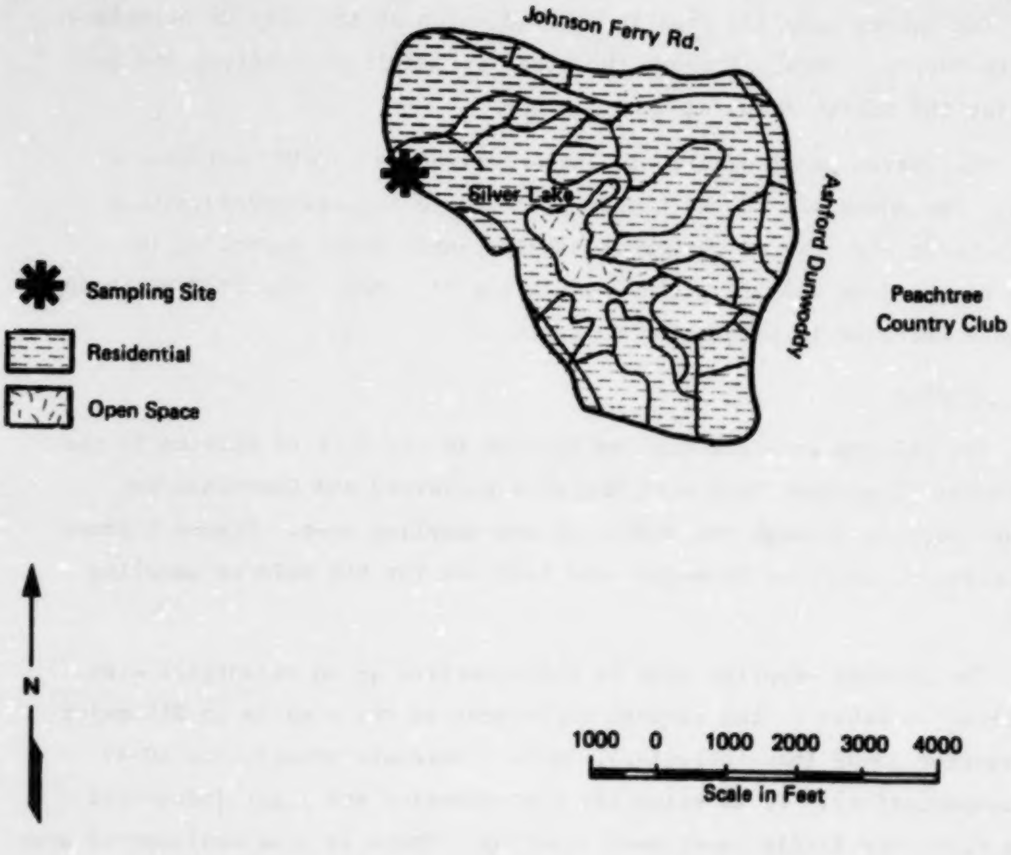
Johnson Ferry Rd.
Silver Lake
Ashford Dunwoody
Peachtree Country Club
Sampling Site
Residential
Open Space
N
1000 0 1000 2000 3000 4000
Scale in Feet

FIGURE 8 WARREN—LAND USE AND STREETS

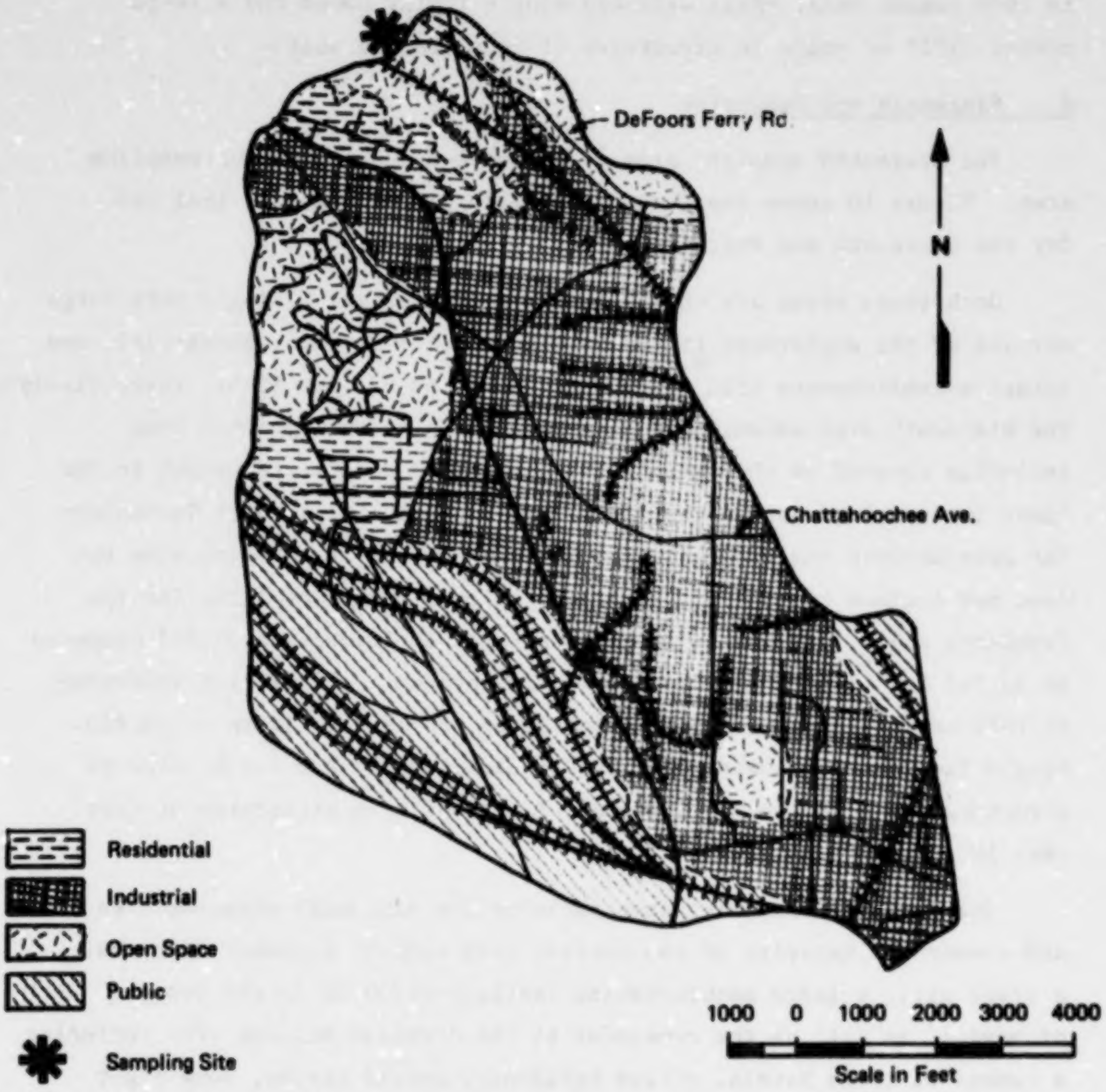
DeFoors Ferry Rd
N
Chattahoochee Ave.
Residential
Industrial
Open Space
Public
Sampling Site
1000
0
1000
2000
3000
4000
Scale in Feet

FIGURE 9 DEFOORS-LAND USE AND STREETS

to 1970 census data, there were 425 single family homes and a large number (171) of units in structures of less than 10 units.

8. Sixteenth and Peachtree

The Sixteenth sampling area is a subset of the Peachtree sampling area. Figure 10 shows the streets, sampling locations, and land use for the Sixteenth and Peachtree areas.

Both these areas are characterized as commercial having a very large portion of the employment figure attributable to service, commercial, and retail establishments (SIC categories 70-89, 60-67, and 50-51, respectively). The Sixteenth area encompasses a large portion of the downtown area including several of the large hotels, the Five Points area which is the "most intense land use in the city," the Georgia Institute of Technology. The area borders the football field of the Georgia State University but does not include the university itself. Total number of firms for the Sixteenth subset was 637 in 1975 for a total employment of 35,547 compared to 38,547 for 1970 (an 8% decrease in employment). Population according to 1970 census data was 13,189 compared to our 1978 estimate of 12,810. Single family homes number 958 (1970 census); there are 2,239 units in structures of more than 10 units and 1,131 units in structures of less than 10 units.

The Peachtree sampling area includes the Sixteenth sampling area and covers the majority of the Georgia Tech campus, a number of parks, a steel mill, a large manufacturing facility which is in the process of moving, as well as the remainder of the downtown Atlanta area including a number of large hotels, office buildings, retail stores, some light manufacturing establishments, several universities, and some residences such as the high income housing in Ansley Park--a 1,900 unit subdivision. The area also includes several hospitals and golf courses. Population for the Peachtree sampling area according to 1970 census data was 60,003 compared to the 1978 estimate of 52,426. Single family residences number 6,379 (1970 census). Total number of firms in 1975 is estimated at 2,835; the total employment figure in 1970 was 137,616 compared to 134,793 in 1975 (a 2.1% decrease in employment). These data include the subset of Sixteenth sampling area.

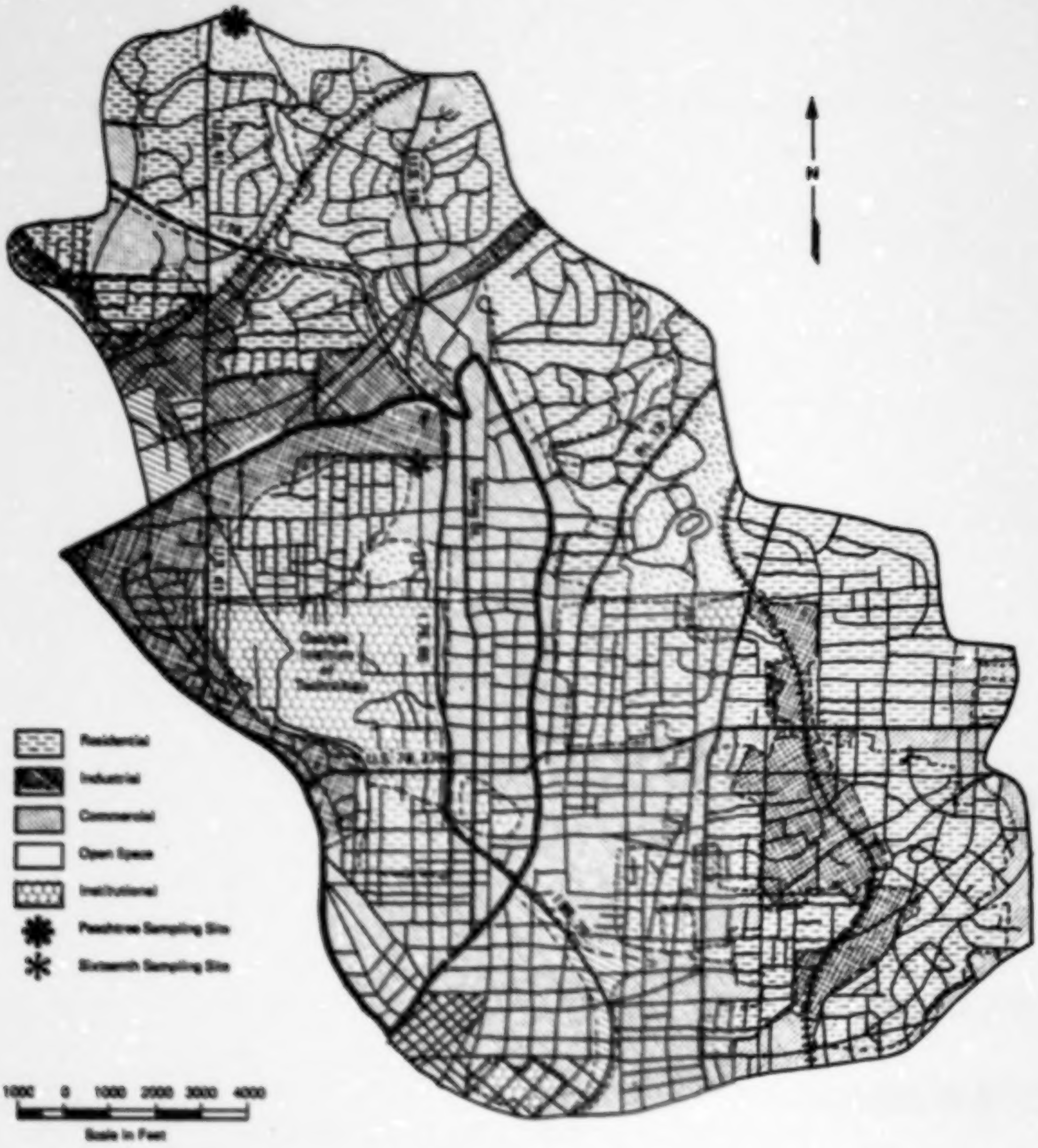
N
Georgia Institute of Technology
Residential
Industrial
Commercial
Open Space
Institutional
Peachtree Sampling Site
Sixteenth Sampling Site
1000 0 1000 2000 3000 4000
Scale in Feet

FIGURE 10 PEACHTREE AND SIXTEENTH—LAND USE AND STREETS

IV. SAMPLING PROCEDURE

A. Sample Collection

For the most part, the sample collection procedure used in Atlanta was comparable to that used in the Cincinnati and St. Louis studies.[4,5] As before, sample collection was performed utilizing a manual collection technique in which a two liter stainless steel graduate (bucket) was repeatedly lowered into the flow of wastewater to fill the required number of sample bottles. Each sampling site was visited every four (4) hours and twelve individual increments were composited to produce a single sample representing a 48-hour period. The increments were combined in the laboratory on a flow proportioned basis.

All of the field sampling procedures were those employed in Cincinnati. Upon arriving at each sampling location, the field crew would first measure the temperature, pH, and oxidizing potential of the wastewater (with potassium-iodide starch paper) and then collect the required amount of wastewater as identified on a chart within the field sampling procedures manual (see Appendix A). The necessary volume of each sample increment was calculated to insure that adequate volume was collected each time to allow for accurate flow compositing over a daily variation ratio of three to one. Using this protocol, the total volume of wastewater collected was sufficient to produce a final "sample" that was made up of those fractions listed in Table 4.

After all of the sampling steps had been completed (including collection, labelling, preservation, clerical documentation, and packaging), the volume of wastewater passing through the sampling location was determined. The depth of flow was measured and a flow measurement was obtained by using the Manning equation. All flow compositing of the collected sample increments was done using the flow rate computed in this way.

B. Flow Measurements

As in Cincinnati and St. Louis, initial flow calculations were made

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Table 4

SUMMARY OF FINAL SAMPLE FRACTIONS AND THEIR REQUIRED VOLUMES

Priority Pollutants	Code	Normal Sample	QC'd Sample
• Acid/Base Neutral fraction	(ABN)	2L	6L
• PCB/Pesticide fraction	(PCB)	1L	3L
• Total Phenol fraction	(Phen)	1L	3L
• Cyanide fraction	(CN)	1L	3L
• Metal fraction	(M+)	1L	3L
• Mercury fraction	(Hg)	1L	3L
• Asbestos fraction	(As)	1L	3L
• Volatile Organic fraction	(VOA)	45mL	45mL
Classical Parameters			
• Ammonia	(NH_3)	1L	1L
• Chemical Oxygen Demand	(COD)	500mL	500mL
• Total Organic Carbon	(TOC)	500mL	500mL
• Biological Oxygen Demand	(BOD)	1L	1L
• Total Suspended Solids	(TSS)	1L	1L
• Oil and Grease	(O+G)	1L	1L

using the Manning equation approach. After completing all of the field work, a review of the average flow rates for each of the sampling locations suggested that the values obtained were higher than could reasonably be expected; a difference that could not be explained by inflow and infiltration alone. The basis of this belief lay in the fact that while the remote sampling sites accounted for roughly 15 to 20% of the basin's land mass, the measured flow apparently accounted for almost 80% of the wastewater that was tributary to the R. M. Clayton treatment facility. Even though four of the selected sampling sites included industrial components and one contained a highly concentrated commercial district, which presumably use and discharge more water into collection systems than do comparably-sized residential zones, the possibility that these areas alone accounted for the disparity seemed remote.

In an attempt to determine whether the recorded values were, in fact, reasonable, a theoretical flow evaluation of each of the remote sites and the entire drainage basin was performed, as had been done for St. Louis. The commercial and industrial flow for each sampling site and the entire basin was estimated from water use records. The residential flows for each site and for the basin were estimated based on a 100 gal/day/person effective flow. These data are tabulated in Table 5.

Unfortunately, the results of this theoretical flow evaluation were not as good as for the St. Louis work; the St. Louis effort resulted in accounting for the POTW flow within 5%, but the theoretical analysis of flow in Atlanta only accounted for 75% of the influent flow. Several factors probably contribute to this noted discrepancy, the foremost being the complexity of the data base used to extract usage records for commercial and industrial accounts. Nevertheless, this theoretical flow evaluation did suggest that the indicated flow rates obtained at many of the field sampling sites were higher than could reasonably be expected. Therefore, a re-evaluation or calibration of the initial depth of flow measurements was performed.

The basis of this work originates in experiments conducted during the Hartford study (the fourth survey in this series) and is explained

Table 5

TOTAL THEORETICAL FLOW THROUGH EACH SAMPLING POINT IN ATLANTA

Location	Residential Flow (lps)	Commercial Flow (lps)	Industrial Flow (lps)	Total Flow (lps)
DeFoors	8.5	9.6	60.6	78.7
Lenox	8.1	30.0	0.0	38.1
Northside	45.0	16.5	0.0	61.5
Peachtree (including Sixteenth)	229.7	329.8	172.6	732.1
Sixteenth Street (Subset of Peachtree)	56.1	130.0	126.8	312.9
Ensign	15.5	18.3	8.7	42.5
Surrey	1.8	2.8	64.8	69.4
DeKalb	8.2	3.0	0.2	11.4
Warren	10.6	0.0	0.0	10.6
Basin excluding above	1361.1	163.1	185.2	1709.4
Total basin found	1688.5	573.1	492.1	2753.7
	61.3%	20.8%	17.9%	

in greater detail within that report.[6] Generally, however, the correction factor evolves from flow measurements obtained using a direct velocity determination and a depth of flow value versus Manning equation determinations.

Since the calibration process was repeated at least seven times during a two day period, a wide range of flow values were averaged to produce the final "correction factor" for each of the specific sites. These correction factors were site specific and could be applied to all flow rates derived from the Manning equation in order to correct the reported values. The correction factors showed no trend dependent on total flow.

The original average flow rates, correction factors, final average flow rates, and theoretical flows are presented in Table 6 for review. The corrected values are in much better agreement with the theoretical values.

Table 6

SUMMARY OF ATLANTA FLOW VALUES

LOCATION	MEASURED FLOW CALCULATED BY MANNING EQUATION	CALCULATED VELOCITY TO MANNING FACTOR	CORRECTED FLOW	ESTIMATED THEORETICAL FLOW
Northside	111.3	0.931	103.6	61.5
Warren	8.5	1.057	9.0	10.6
Lenox	38.0	0.531	20.2	38.1
DeKalb	10.6	0.641	6.8	11.4
Peachtree (Including Sixteenth)	2749	0.583	1602	732
Sixteenth	267.5	0.874	233.8	313
Ensign (Including Sexton)	117.1	0.369 (0.555)	54.1	42.5
			41.6	69.4
Surrey	149.7	0.278		
DeFoors	118.2	0.696	82.2	78.7

V. CHEMICAL ANALYSIS

A. Chemical Procedures

1. Introduction

The procedures used to analyze samples collected in Atlanta were the same as those used for the Cincinnati and St. Louis samples. These procedures are described in the EPA Screening Protocol,[1] the Quality Assurance Program,[2] and the Cincinnati and St. Louis POTW reports,[4,5] which are the second and third in this series of reports on sources of priority pollutants. Chemical analysis of the samples included producing a flow-composited sample from the individual field samples, appropriate sample preparation (extraction, acid digestion, etc.), and subsequent instrumental analysis.

2. Modified Procedures

The internal standard procedure for the acid and base/neutral analyses has been changed. Also, the procedures used to analyze the priority pollutants in the volatile and pesticide categories have been modified. Details on all the analytical procedures are given in Appendix B and Appendix C.

a. Acids and Base/Neutrals - Internal Standards

The internal standard, d_{10}-anthracene, was previously added to the aqueous sample aliquots for acid and base/neutral priority pollutant analyses; it has been shown that the d_{10}-anthracene was extracted with 95-100% efficiency.[5] However, during the Atlanta study, d_{10}-anthracene was added to the final concentrated methylene chloride extract, thereby eliminating any question with respect to the effects of sample preparation on internal standard levels.

In order to assess the impact of this change in procedure and have a direct measure of accuracy and precision for all samples, four additional total method internal standards were added to each of the aqueous sample aliquots (before sample prepration) as monitors of extraction and concentration, as well as instrumental analysis. The four compounds chosen were 2-fluoronaphthalene, octafluorobiphenyl, decafluorobiphenyl, and

9-phenylanthracene. These were chosen because they do not normally occur in the environment, and they have distinctive mass spectra for identification and quantification.

These four internal standards were added to the acid and base/neutral aqueous sample aliquots prior to sample preparation to give a final concentration level of 5 µg/L. D_{10}-anthracene was added to the final concentrated methylene chloride extracts at a concentration of 5 µg/2mL. Detailed information concerning the internal standards is given in Appendix C. The sample concentrations of the internal standards were compared with calibration standards to determine recoveries. For the acid analysis, the average recovery for 2-fluoronaphthalene, octafluorobiphenyl and decafluorobiphenyl was approximately 85%. For the base/neutral analysis, the average recovery for the four internal standards was 92%. By comparison, the average recovery value for d_{10}-anthracene (added after sample preparation and extraction) was 101% for the acid fraction and 106% for the base/neutral fraction.

b. Volatiles

The purge and trap, gas chromatography/mass spectroscopy method for analyzing volatile priority pollutants was altered by the addition of charcoal to the sorbent trap. This was an initial attempt to prevent the gas from breaking through the trap. The procedure change was successful for chloromethane, bromomethane, vinyl chloride and chloroethane.

c. Pesticides and PCBs

The method used for analyzing compounds in the pesticide and PCB category was expanded by using a third GC column to corroborate the preliminary identifications.

3. Other Comments

Data on the field blanks can be found in Appendix B. The data indicate that contamination in both the laboratory and the field are in control.

There were some compounds consistently not detected using the EPA

Screening Protocol.[1] These compounds are listed below; they were also not detected during the Cincinnati and St. Louis studies.

Standards Not Detected by EPA Method

Volatiles:	Dichlorodifluoromethane
Base/Neutrals:	Bis(chloromethyl)ether 2-Chloroethyl vinyl ether Hexachlorocyclopentadiene

It is important to note that three compounds - chloromethane, vinyl chloride, and bromomethane - previously not detected in the QC samples, were detected during the Atlanta study due to the modified purge and trap method.

The reporting limits for the organic and inorganic priority pollutants can be found in Appendix B. Reporting limits are comparable to or better (lower) than those used for the Cincinnati or St. Louis studies. Complete data from the chemical analyses have been tabulated by site and chemical compound in Appendices D and E.

B. Quality Assurance/Quality Control

1. Introduction

A quality assurance program was employed for this study in order to document the reliability of the data obtained on the priority pollutants found in the sample. The quality control procedures used for the Atlanta study are detailed in the Cincinnati report.[4] The specific quality control (QC) activities for sample analysis were based on the general recommendations published by EMSL/EPA, Cincinnati, as specifically abstracted for this type of program in the March 1978 document.[2]

The quality control (QC) data obtained from the Atlanta study were comparable to, or better than, the QC data from the Cincinnati and St. Louis studies. For the Atlanta study, QC data were also obtained on the classical parameters. The precision for these analyses was better than the generally accepted range.

2. Program

For the field sampling trip to Atlanta, five samples (representing a range of source types) were chosen as quality control samples. Two of these were set aside as contingency QC samples to be used if procedural difficulties were encountered. For some analytical categories, this was a departure from the original protocol which called for one QC set to be analyzed per day. The three QC samples generated 15 samples to be analyzed. Including the two field blanks, the total number of samples associated with the QC/QA program was 17, 37% of the total number of samples analyzed. The specific samples associated with quality control activities, including the calculations used to determine if the analysis is in control, are described in the Cincinnati and St. Louis reports.[4,5]

An additional feature of the quality assurance program for the Atlanta survey was the use of the four "total method" internal standards that were added to all the acid and base/neutral samples prior to extraction. In this way, quality control data measuring the precision and accuracy of the entire method were made available for all of these samples. Details concerning the internal standards are discussed in Appendix C.

3. Results

The quantitative results for each pollutant studied are detailed in Appendix B. QC data were not obtained on five of the compounds - bis(2-chloroisopropyl)ether, 2,3,7,8-TCDD, indeno(1,2,3-cd)pyrene, endrin aldehyde, and endosulfan sulfate - because it was not possible to obtain reference supplies for these priority pollutants.

There are a few compounds for which the recommended protocol is problematic. Due to the detailed quality control program, these problems could be traced back to specific technical difficulties. Two compounds that were generally problematic during the St. Louis and Atlanta studies were N-nitrosodimethylamine and benzidine. During the Atlanta study, problems were also encountered with the analysis of antimony in the nine samples from industrial sources. Since these were generally the most complex samples, it is believed that matrix interferences unique to these nine samples were responsible. Detailed information concerning the analytical problems can be found in Appendix B.

For convenience in reviewing the data, Table 7 has been prepared summarizing the overall results achieved within each of the analysis categories for Atlanta QC samples. In general, these results are very good. Most recovery values are in the 70% to 100% range, and the precision is about 10% to 30%.

C. Chemical Characterization of Influent Composition

In order to gain some perspective on how many of the chemicals and pollutants present in the samples are actually included in the Priority Pollutant Protocol, one sample of the Atlanta POTW influent was studied in detail. The study was confined to those species present in the acid (/neutral) and base/neutral extracts and which are measurable by GC/MS. Other organic species which may have been present in the water but not extracted and species which do not chromatograph under the test conditions would obviously not be observed in this analysis.

The major components found that were not among those classified as priority pollutants include paraffins, phthalates, alkylated polynuclear aromatic hydrocarbons and phenols, fatty acids and esters. Other compounds identified include alpha-terpineol, caffeine, tributyl phosphate, diphenyl methane, 2-butoxy ethanol (butyl cellusolve), camphor, coumarin, and acetylsalicylic acid.

Figures 11 and 12 are the reconstructed gas chromatograms for the acid/neutral and base/neutral extracts, respectively. Each of the peaks is labeled for its primary constitutent. The elution position of priority pollutants which are visible in these traces are indicated by an underline; the internal standards are identified by "I.S." on the chromatogram. It can be seen that the peaks for priority pollutants do not entirely reflect that pollutant in most cases.

Table 7

SUMMARY OF QUALITY ASSURANCE DATA FOR ATLANTA

Category	Average Spiking Level, µg/L	Method Reference[a]		Raw Wastewater[a]	
		Average Recovery	Average Standard Deviation	Average Recovery	Average Standard Deviation
Volatiles	20	93[b]	±23[b]	83[b]	±27[b]
Acids	50	72	±11	77	± 7
Base/Neutrals	50	59	±23	62	±15
Pesticides and PCBs	10	74	±16	74	±18
Total Cyanides	20	87	±12	77	±13
Total Phenols	60	102	± 3	97	± 6
Metals	10 → 100	102	±11	90	±17
Classical Parameters		81	±14		

[a] Average of all mean percentage recovery values for each compound and average of all mean percentage recovery standard deviations for each compound.

[b] Gas (compound No.'s 101 → 105) data has been excluded.

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A212C1 A212C-2UL.4/24.SP1240B-:85.1P-185/10.1900V

RGC AMP.: 01547040

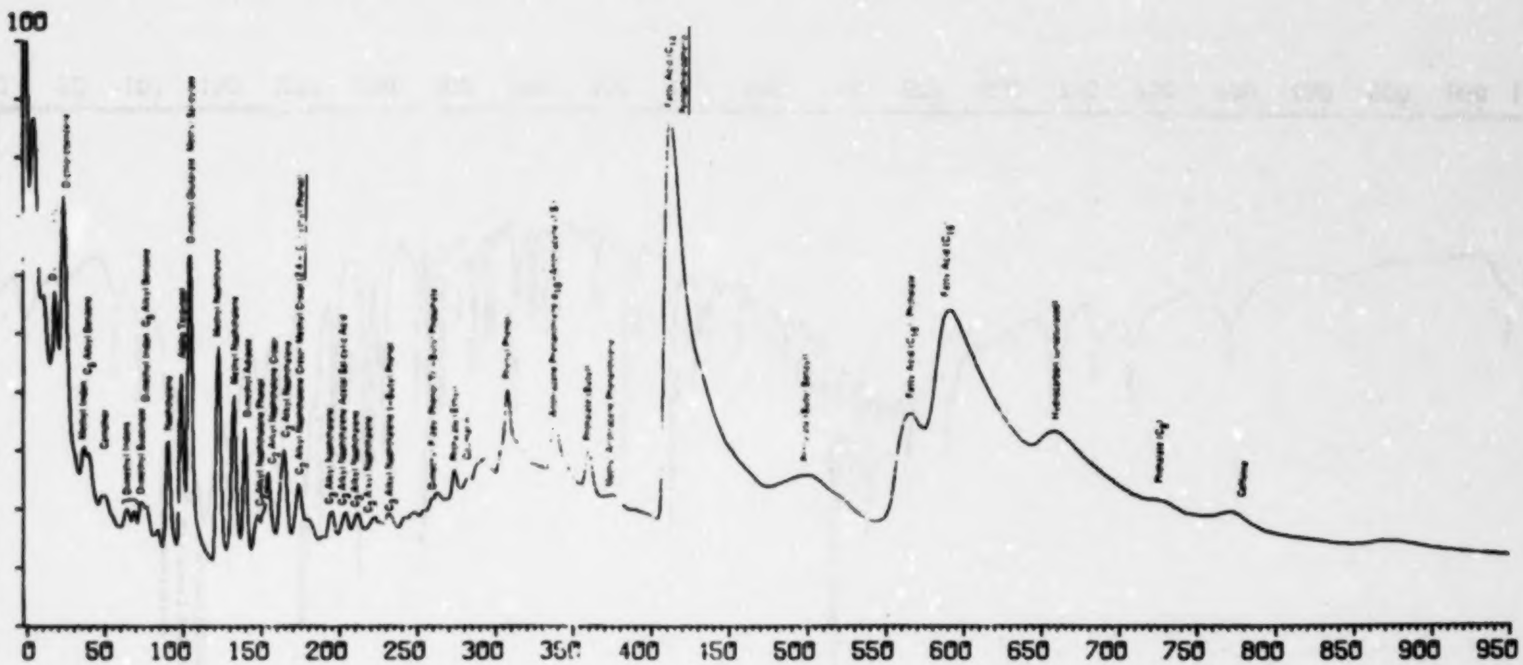


FIGURE 11. Reconstructed Gas Chromatogram for Acid/Neutral Extract

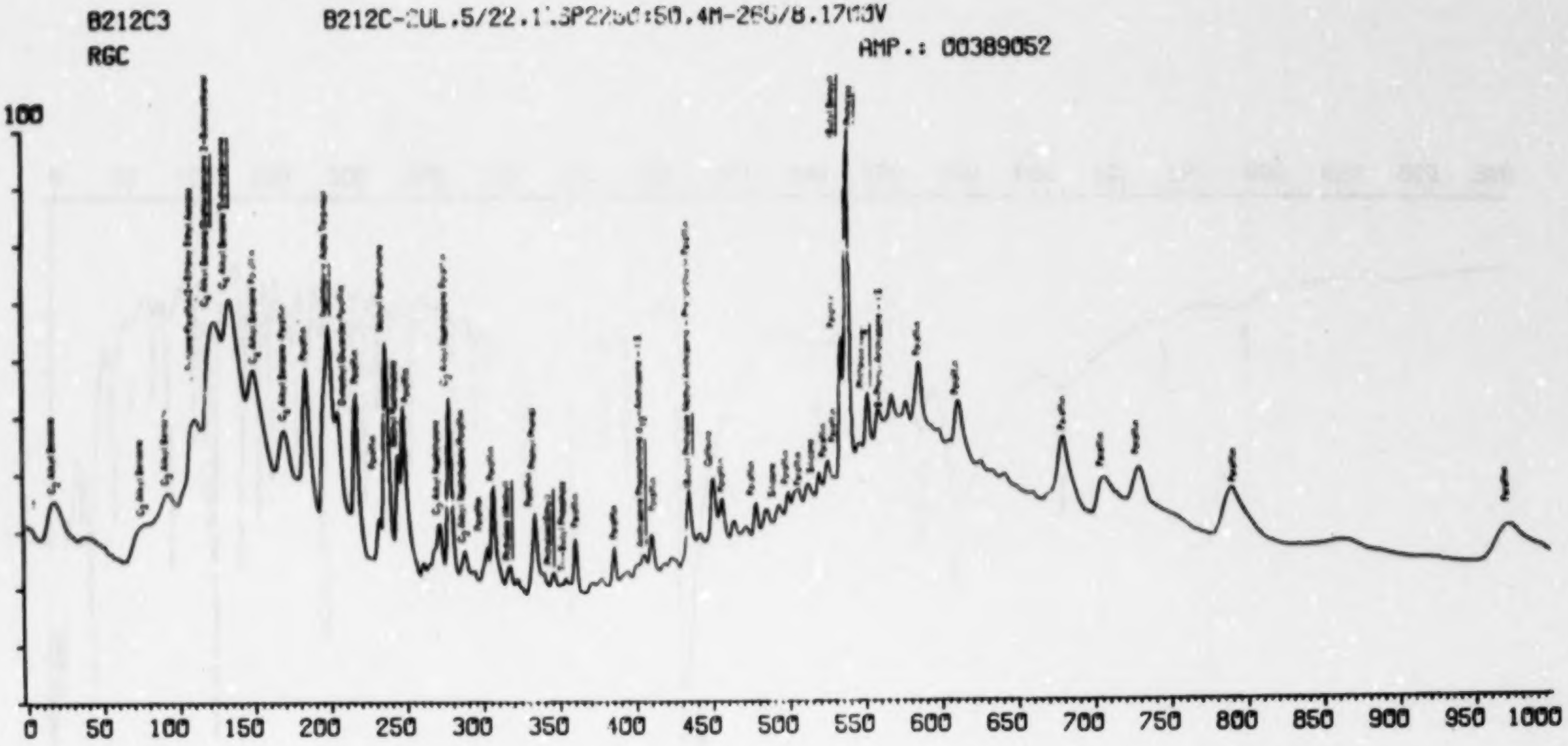


FIGURE 12. Reconstructed Gas Chromatogram for the Base/Neutral Extract

Where possible, the concentration of each of the major species was estimated by rough approximation of calibration curves based on similar compounds for which calibration data were available. In total, the priority pollutant acids (phenols) account for only about 1% of the chromatographable acid species. The base/neutral priority pollutants account for about 15% of the species observed in the total base/neutral chromatogram. Table 8 gives a list of species observed and their approximate concentration levels.

Table 8

POTW INFLUENT CHEMICAL CHARACTERIZATION

Compound(s)	Approximate Concentration (µg/L)	Priority Pollutant Concentrations(µg/L)
Paraffins (Hydrocarbons)	700	-
Alkyl Benzenes (C_0-C_5)*	90	49
Naphthalenes (C_0-C_4)	130	85
Anthracenes (C_0-C_2)	10	3
Biphenyls (C_0-C_2)	7	-
Indans (C_1-C_3)	10	-
Fatty Acids - C_{14}+C_{16}	7000	-
Phenols (C_0- C_5)	400	78
Phthalates	200	160
Other Species		
Alpha terpineol	100	
Caffeine	50	
Tri-butyl phosphate	20	
Butyl cellusolve	600	
Camphor	5	
Coumarin	0.5	
Dimethyl succinate	30	
Dimethyl glutarate	100	
Dimethyl adipate	20	
Methyl salicylate	5	
Butyl salicylate	0.5	
Acetylsalicylic acid	5	
2-Ethoxy ethyl acetate	300	

*indicates number of side chain carbons

VI. DISCUSSION OF RESULTS

This section presents a discussion of results based on an analysis of the Atlanta data, by itself. Further interpretation of the data will be done in the final report which will examine the data from all of the cities studied. The detailed data used to prepare the summaries in this discussion are given in Appendices A (Sampling) and D (Chemical Results).

It is possible to review the massive amount of data obtained during this study in myriad ways. For the purposes of this discussion section, the material has been organized into three general categories: the frequency of detection (grouped by pollutant), the concentration levels observed and various mass flow analyses.

A. Frequency of Observation

In the R. M. Clayton drainage basin, 35 organic priority pollutants (or pollutant categories) and 11 priority pollutant metals plus manganese were observed. Total phenols and total cyanides were also detected as were the six classical parameters measured in this study -- ammonia, oil and grease, TSS, TOC, COD, and BOD. A total of 32 samples were collected: 6 from residential sources, 12 from commercial/downtown sources, 9 from industrial sources, 3 from the POTW influent, and 2 tap water samples. In addition, two field blanks were prepared. Figure 13 shows the frequency with which each pollutant was observed in the 32 actual samples. The average concentration measured when present is given in the last column. Eight (8) of the organic pollutants, 7 of the metals and total phenols were observed more than 50% (16 samples) of the time. Five (5) of the metals were observed 100% of the time.

A further perspective on this data is given in Figure 14. In this figure, the average overall concentration (average concentration over all 32 samples as opposed to the average measured concentration in Figure 13) is plotted against the frequency with which a pollutant was detected. Fifteen (15) organic priority pollutants are seen to occur with an average overall concentration greater than 10 μg/L; only seven of these occur more than 50% of the time. Two organic pollutants -- chloroform and 1,1,2,2-tetrachloroethylene -- occur in 90-100% of the samples, as they

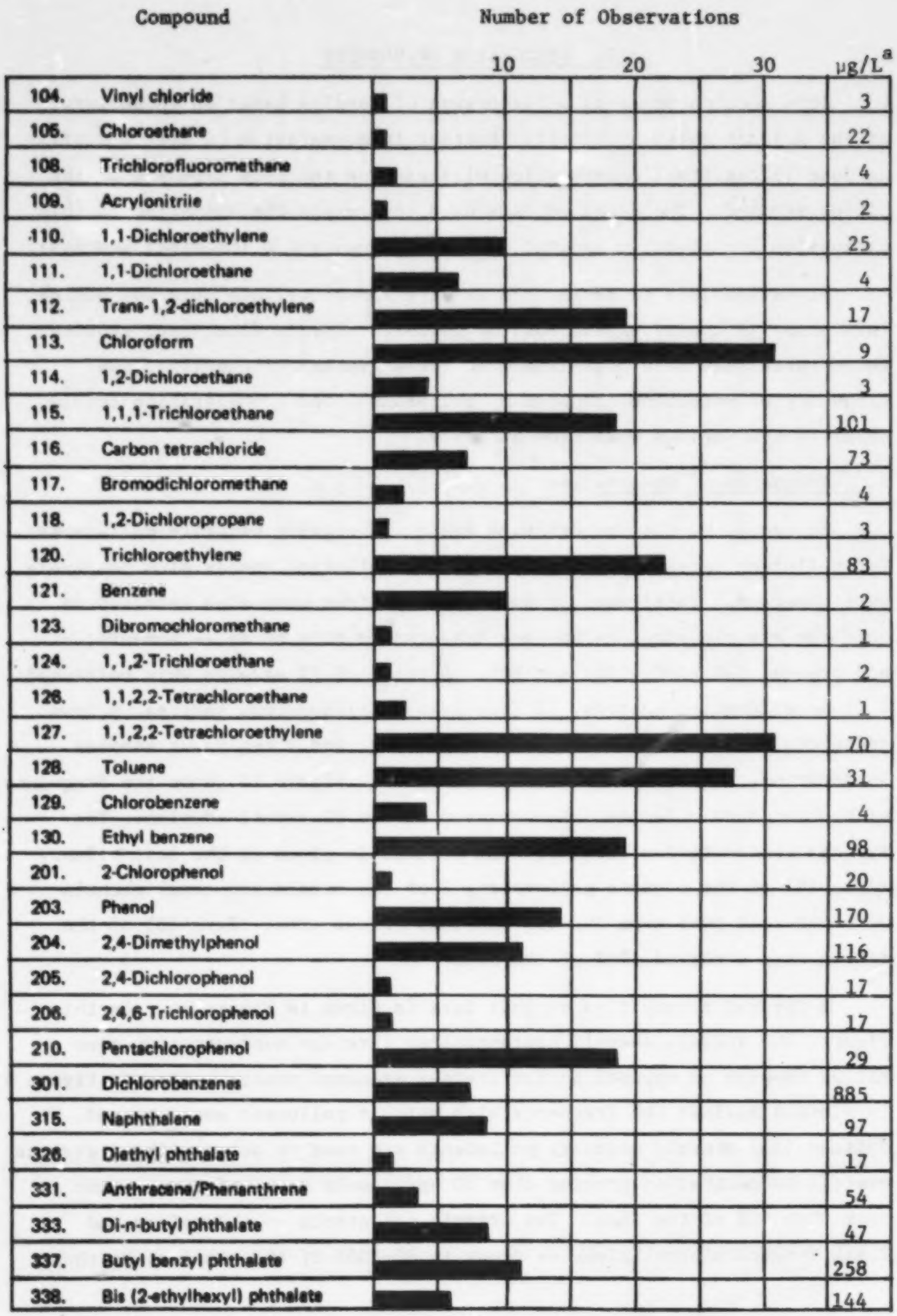
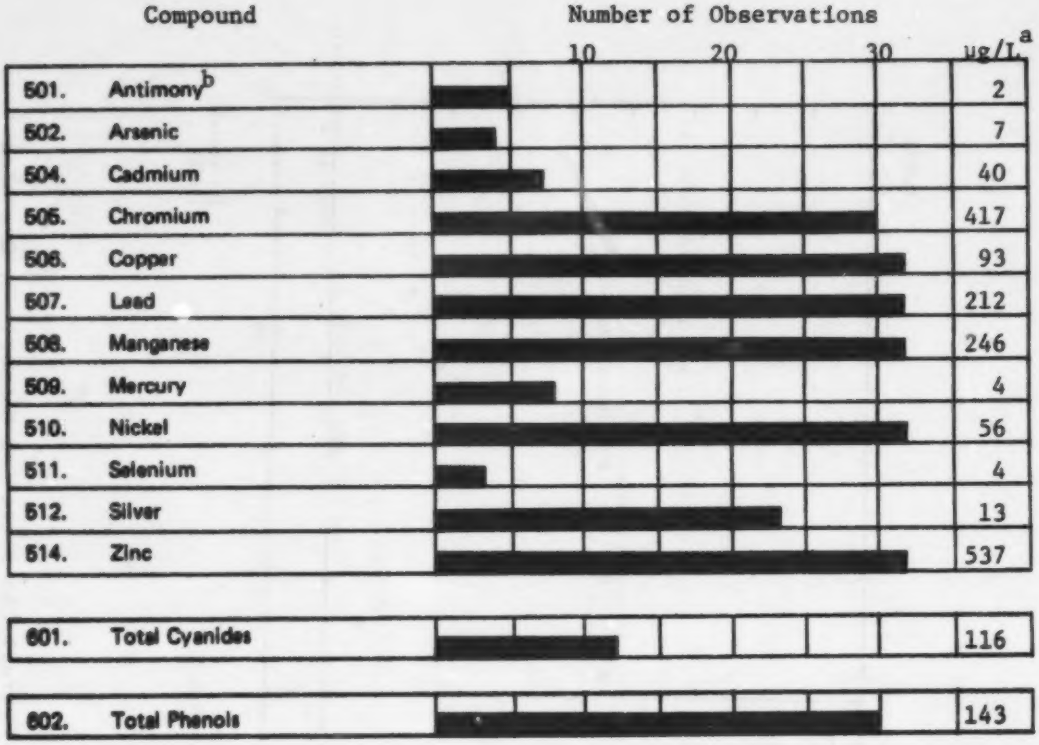


FIGURE 13. Overall Frequency of Observation



[a] Average concentration when detected (32 samples)

[b] 23 samples analyzed

FIGURE 13. (Continued) Overall Frequency of Observation Metals, Cyanides, and Phenols

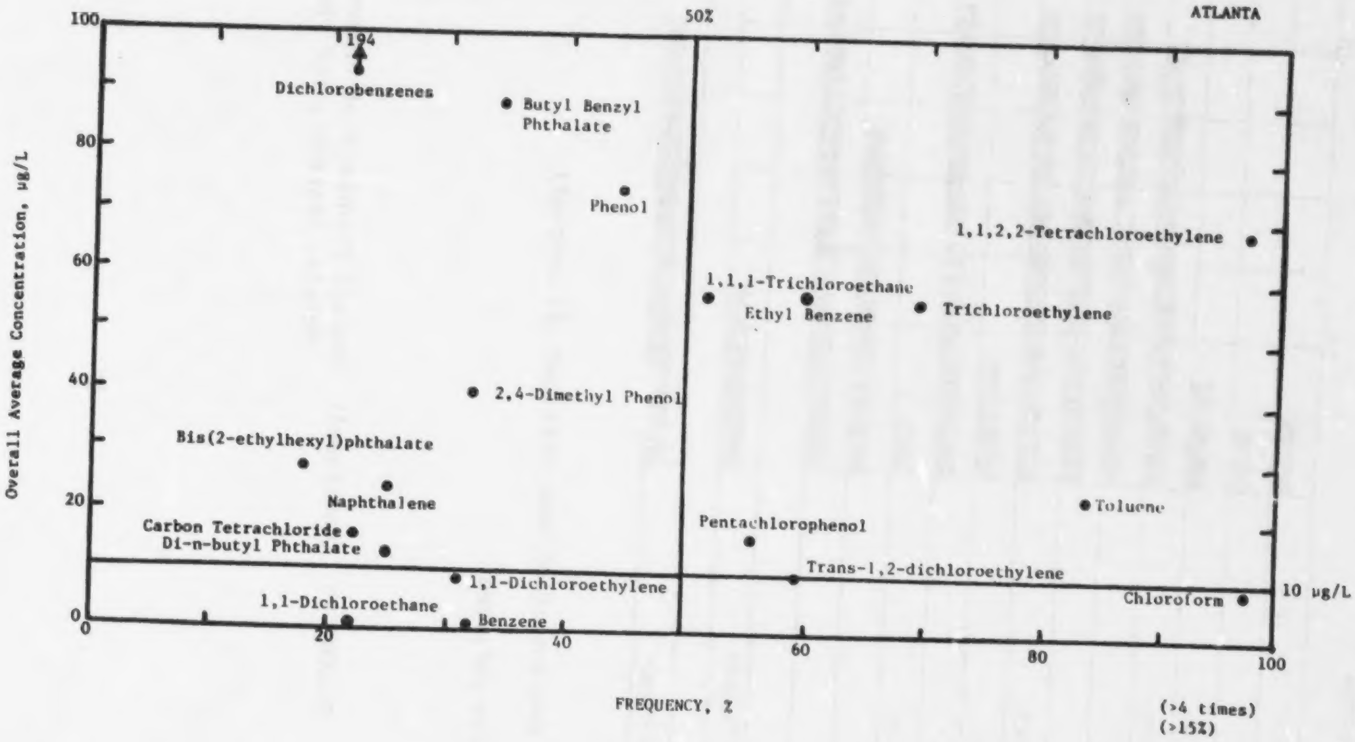


FIGURE 14. Frequency of Detection and Overall Concentration Comparison, Organics

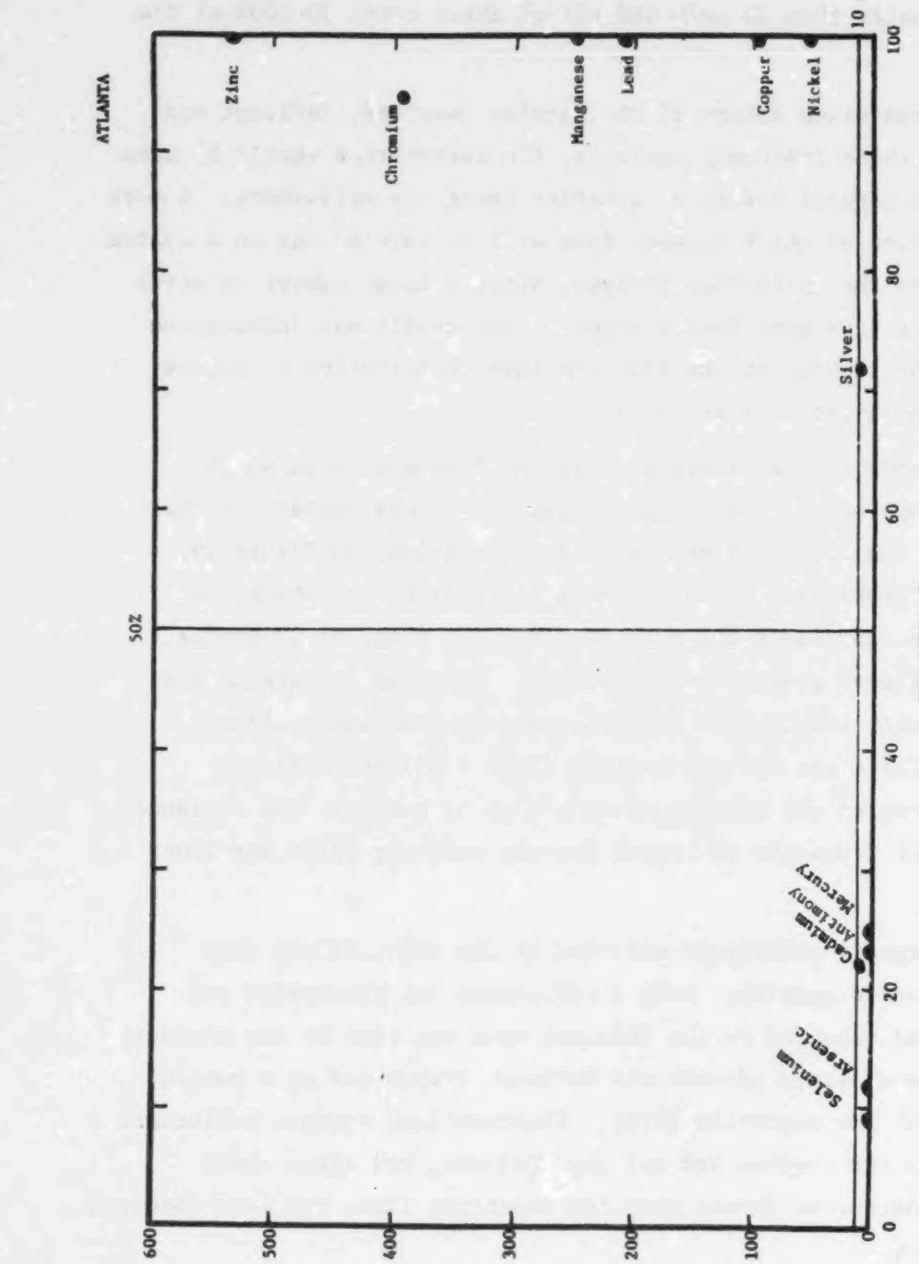


FIGURE 14 (cont'd). Frequency of Detection and Overall Concentration Comparison, Metals did in St. Louis. Six (6) of the metals are observed at an average concentration greater than 10 μg/L and all of these occur 90-100% of the time.

Because of the mixed nature of the samples (sources, influent and tap) included in these frequency analyses, the information should be used only to determine general trends of behavior among the pollutants. A more valid interpretation of the frequency data will be carried out on a source by source basis in the multi-city analysis after a large number of sites within each source type have been studied. Some additional information can be obtained by looking at the relative mass contribution by source type, as presented later in this section.

To provide some further insight as to the frequency with which priority pollutants occur, the percent frequency of observation in the sources only and the POTW influent have been summarized in Figure 15. The solid black bar represents the sources (excluding tap) while the cross-hatched bar represents the POTW influent. A total of 27 source samples and 3 influent samples were analyzed. As these bar graphs are examined, the reader should bear in mind that the resolution element is considerably different for the sources (1/27 = 4%) and influent (1/3 = 33%) because of the numbers of each type of sample. The variance of the estimate of frequency is higher for the influent which has fewer samples.

Of the 19 organic pollutants detected at the POTW, 17 are also present in the source samples. Only 2 pollutants (acrylonitrile and diethyl phthalate) observed in the influent were not seen in the sources; each of these was observed in only one influent sample and at a concentration level near the reporting limit. Fourteen (14) organic pollutants were seen only in the sources and not the influent, but again these were all at concentration levels near the reporting limit and were observed with low frequency.

There were no metals seen at the POTW which were not seen in the sources; total cyanides and total phenols were also measured in both the sources and the influent. Arsenic and selenium were seen in the

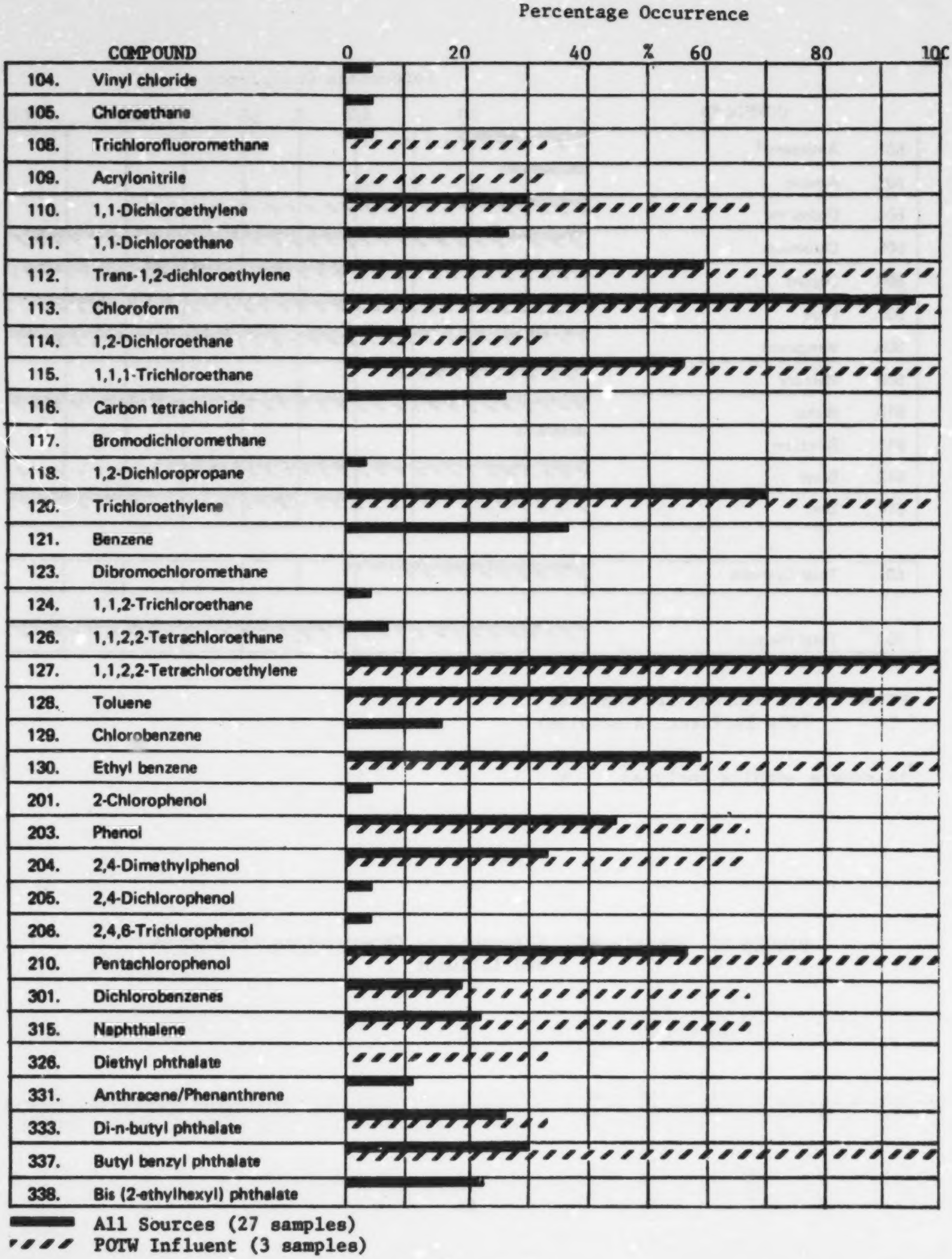
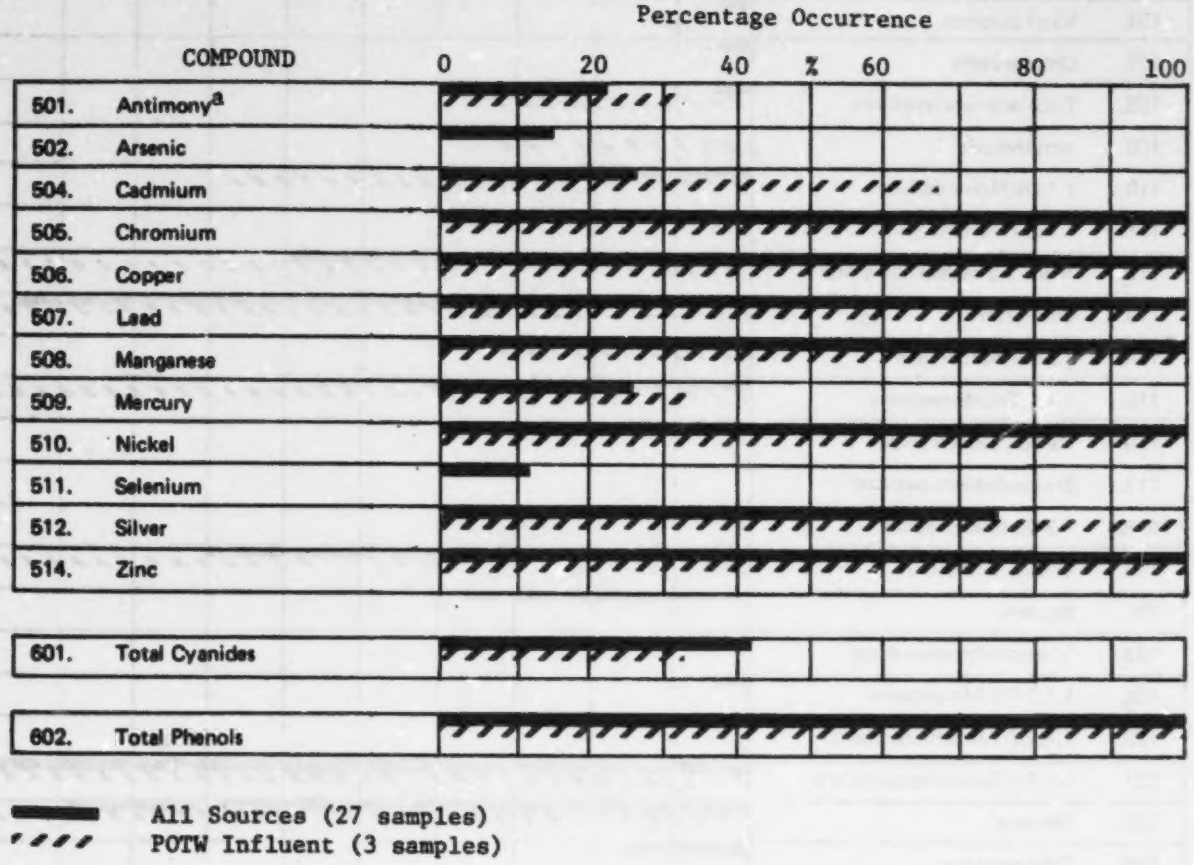


FIGURE 15. Frequency of Observations in Sources and Influent



[a] 18 source samples analyzed

FIGURE 15. (Continued) Frequency of Observations in Sources and Influent sources only, but at low frequency and a concentration level near their reporting limits.

Table 9 gives a list of pollutants (77) which were never detected in any of the samples. Those compounds for which the analytical methods are still problematic are indicated by an asterisk.

B. Concentration of Priority Pollutants

Flow-weighted averages of the six sampling days were calculated for all of the pollutants detected and are tabulated in Table 10.

In Table 11, the simple arithmetic average of the pollutant concentrations for each of the source types has been presented along with the tap water and influent, as an aid to discover the patterns that may be present in the concentration data. Only those chemicals which were observed more than three times are included in this summary. It is recognized that the concentration data by themselves do not provide the basis for estimating POTW influent values, but they are useful in observing the differences in chemical activity among the sites.

The characteristics of the Atlanta area and the R. M. Clayton basin, in particular, provided the opportunity to sample a large fraction of chemically intensive industrial areas, as well as the chance to sample an entire downtown commercial area for the first time in this series of studies. The primary industrial activities sampled include manufacturing, transportation, and wholesale trade.

The overall pollutant concentration values in the downtown (Peachtree) site are surprisingly low in view of the large area and amount of activity represented in that area. The downtown site represents about 25% of the total influent flow. Nevertheless, the downtown levels are comparable to the other commercial averages and the residential values. Trichloroethylene is present at a high level in this area (general cleaning activities) as are lead and zinc (probably associated with the old residential area or the large amount of automobile traffic).

The pollutant concentration levels for the industrial sites are the highest seen to date in these studies and are clearly reflected in higher

Table 9

COMPOUNDS NOT DETECTED

101 Chloromethane
**102 Dichlorodifluoromethane
103 Bromomethane
107 Acrolein
119 Trans-1,2-dichloropropylene
122 Cis-1,3-dichloropropylene
125 Bromoform
202 4-Nitrophenol
207 4-Chloro-3-cresol
**208 2,4-dinitrophenol
**209 4,6-dinitro-2-cresol
211 4-Nitrophenol
304 Hexachloroethane
*305 Bis(chloromethyl)ether
306 Bis(2-chloroethyl)ether
307 Bis(2-chloroisop pyl)ether
**308 N-Nitrosodimethylamine
309 Nitrosodi-n-propylamine
310 Nitrobenzene
311 Hexachlorobutadiene
312 1,2,4-Trichlorobenzene
*313 2-Chloroethyl vinyl ether
314 Bis(2-chloroethoxy)methane
316 Isophorone
*317 Hexachlorocyclopentadiene
318 2-Chloronaphthalene
319 Acenaphthylene
320 Acenaphthene
321 Dimethyl phthalate
322 2, 6-Dinitrotoluene
323 4-Chlorophenyl phenyl ether
324 Fluorene
325 2,4-Dinitrotoluene
327 1,2-Diphenylhydrazine
328 N-Nitrosodiphenylamine
329 Hexachlorobenzene
330 4-Bromophenyl phenyl ether

334 Flyoranthene
335 Pyrene
**336 Benzidine
340 Chrysene/Benzo(a)anthracene
342 3,3'-Dichlorobenzidine
343 Benzofluoranthenes
345 Benzo(a)pyrene
346 Indeno (1,2,3-c,d)pyrene
347 Dibenzo(a,h)Anthracene
348 Benzo(g,h,i)perylene
349 TCDD
401 alpha-BHC
402 gamma-BHC
403 Heptachlor
404 beta-BHC
405 delta-BHC
406 Aldrin
407 Heptachlor epoxide
408 Endosulfan I.
409 DDE
410 Dieldrin
411 Endrin
412 DDD
413 Endosulfan II.
414 DDT
415 Endrin aldehyde
416 Endosulfan sulfate
417 Chlordane
418 Toxaphene
419 PCB-1221
420 PCB-1232
421 PCB-1242
422 PCB-1248
423 PCB-1254
424 PCB-1260
425 PCB-1016
503 Beryllium
513 Thallium

**Analytical procedures are inadequate for these pollutants at 10 μg/L. They may have been detected if present at greater than 100 μg/L.

*EPA Screening Protocol Procedures are inadequate to detect these pollutants.

Table 10
FLOW-WEIGHTED AVERAGES
Organics (ug/L)

		NORTHSIDE Residential	WARREN Residential	LENOX Commercial	DEKALB Commercial	PEACHTREE Commercial	SIXTEENTH Commercial	ENSIGN Industrial	SURREY Industrial	DEPOORS Industrial	TAP WATER	POTW INFLUENT
104.	Vinyl chloride	-	-	-	-	-	-	1	-	-	-	-
105.	Chloroethane	-	-	-	-	-	-	7	-	-	-	-
108.	Trichlorofluoromethane	-	-	-	-	-	-	-	2	-	-	1
109.	Acrylonitrile	-	-	-	-	-	-	-	-	-	-	1
110.	1,1-Dichloroethylene	-	-	-	-	-	-	17	3	49	-	9
111.	1,1-Dichloroethane	-	-	-	-	-	-	1	1	8	-	-
112.	Trans-1,2-dichloroethylene	-	-	2	9	-	2	13	0.1	57	-	19
113.	Chloroform	4	5	7	16	4	6	8	5	20	22	7
114.	1,2-Dichloroethane	-	-	-	-	-	-	2	-	2	-	0.4
115.	1,1,1-Trichloroethane	1	-	2	2	2	-	173	73	252	-	96
116.	Carbon tetrachloride	-	-	-	-	-	1	3	15	152	-	-
117.	Bromodichloromethane	-	-	-	-	-	-	-	-	-	4	-
118.	1,2-Dichloropropene	-	-	-	-	-	-	1	-	-	-	-
120.	Trichloroethylene	2	-	-	73	163	81	18	4	68	-	165
121.	Benzene	-	-	-	-	1	1	1	1	2	-	-
123.	Dibromochloromethane	-	-	-	-	-	-	-	-	-	1	-
124.	1,1,2-Trichloroethane	-	-	-	-	-	-	-	-	1	-	-
126.	1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	0.3	-	-	-
127.	1,1,2,2-Tetrachloroethylene	9	2	10	82	10	3	44	124	205	2	239
128.	Toluene	1	1	2	4	4	1	74	124	63	-	26
129.	Chlorobenzene	-	-	-	-	1	-	-	-	6	-	-
130.	Ethyl benzene	-	0.3	6	-	4	-	112	258	229	-	49
201.	2-Chlorophenol		-	-	-	-	-	-	-	7	-	-
203.	Phenol	-	5	4	7	-	-	20	552	233	-	19
204.	2,4-Dimethylphenol	-	4	-	-	-	-	12	301	131	-	10
205.	2,4-Dichlorophenol	-	-	-	-	-	-	-	-	6	-	-
206.	2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-	6	-	-
210.	Pentachlorophenol	10	-	42	-	14	28	-	9	51	-	19
301.	Dichlorobenzenes	-	-	-	7	-	-	5	-	2188	-	93
316.	Naphthalene	-	-	-	-	-	-	-	195	79	-	33
326.	Diethyl phthalate	-	-	-	-	-	-	-	-	-	-	5
331.	Anthracene/Phenanthrene	-	-	-	-	-	-	-	-	54	-	-
333.	Di-n-butyl phthalate	-	5	5	-	-	5	-	43	90	-	4
337.	Butyl benzyl phthalate	-	-	-	33	-	-	377	604	-	-	77
338.	Bis (2-ethylhexyl) phthalate	-	-	-	21	-	-	-	174	84	-	-

Table 10 (Cont'd)

FLOW-WEIGHTED AVERAGES
Metals, Cyanides and Phenols (ug/L)

		NORTHSIDE Residential	WARREN Residential	LENOX Commercial	DEKALB Commercial	PEACHTREE Commercial	SIXTEENTH Commercial	ENSIGN Industrial	SURREY Industrial	DEFOORS Industrial	TAP WATER	POTW INFLUENT			
501.	Antimony	-	2	1	-	-	1	*	*	*	-	1			
502.	Arsenic	-	-	-	-	-	-	-	2	9	-	-			
504.	Cadmium	-	2	-	-	-	-	84	17	2	-	3			
505.	Chromium	24	7	423	7	60	113	33	1881	2137	-	72			
506.	Copper	39	44	51	52	71	45	343	75	163	23	50			
507.	Lead	42	42	49	39	353	109	91	1225	365	13	136			
508.	Manganese	181	246	178	155	324	184	441	166	388	7	278			
509.	Mercury	-	-	-	-	-	-	3	2	6	-	1			
510.	Nickel	3	6	6	18	29	9	9	597	22	4	18			
511.	Selenium	-	-	2	-	1	1	-	-	-	-	-			
512.	Silver	6	-	9	-	13	13	14	8	26	-	12			
514.	Zinc	134	207	172	135	786	173	149	3356	493	210	353			
601.	Total Cyanides	8	-	-	-	11	-	172	236	49	-	5			
602.	Total Phenols	20	21	44	41	38	36	182	446	515	-	100			

*Apparent interference: not analyzed

Table 10 (Cont'd)

FLOW-WEIGHTED AVERAGES
Classical Wastewater Parameter Analysis (mg/L)

	NORTHSIDE Residential	WARREN Residential	LENOX Commercial	DEKALB Commercial	PEACHTREE Commercial	SIXTEENTH Commercial	ENSIGN Industrial	SURREY Industrial	DEFOORS Industrial	TAPWATER	POTW INFLUENT			
Ammonia	9	9	23	6	6	4	4	4	8	-	7			
Oil and Grease	29	34	124	70	60	62	62	431	103	-	29			
TSS	77	294	121	164	223	201	92	434	551	-	138			
TOC	59	74	180	184	55	61	134	196	273	4	68			
COD	362	182	401	667	359	131	318	1350	1068	-	185			
BOD	76	90	245	263	79	79	207	389	525	-	101			

Table 11

CONCENTRATIONS BY SOURCE TYPE* (ARITHMETIC AVERAGES)
μg/L**

		Downtown	Residential	Commercial	Industrial	Tap Water	Influent
110	1,1-Dichloroethylene	0	0	0	25	0	8
111	1,1-Dichloroethane	0	0	0	3	0	0
112	Trans-1,2-dichloroethylene	1	0	6	25	0	20
113	Chloroform	5	4	12	11	22	7
114	1,2-Dichloroethane	0	0	0	1	0	0
115	1,1,1-Trichloroethane	1	1	2	168	0	95
116	Carbon tetrachloride	0	0	0	57	0	0
120	Trichloroethylene	140	1	31	30	0	176
121	Benzene	1	0	0	1	0	0
127	1,1,2,2-Tetrachloroethylene	6	5	47	122	2	240
128	Toluene	2	1	3	81	0	25
129	Chlorobenzene	0	0	0	2	0	0
130	Ethyl benzene	2	0	3	188	0	47
203	Phenol	0	3	6	252	0	19
204	2,4-Dimethylphenol	0	2	0	137	0	9
210	Pentachlorophenol	23	5	19	21	0	19
301	Dichlorobenzenes	0	0	4	657	0	87
315	Naphthalene	0	0	0	75	0	34
333	Di-n-butyl phthalate	3	2	3	36	0	4
337	Butyl benzyl phthalate	0	0	19	276	0	78
338	Bis(2-ethylhexy)phthalate	0	0	11	88	0	0
501	Antimony	0	1	0	NA	0	1
502	Arsenic	0	0	0	3	0	0
504	Cadmium	0	1	0	30	0	3
505	Chromium	86	16	167	1187	0	71
506	Copper	59	38	54	207	23	50
507	Lead	227	39	44	501	13	137
508	Manganese	255	213	177	351	7	280
509	Mercury	0	0	0	3	0	1
510	Nickel	19	4	12	170	4	18
512	Silver	14	3	4	15	0	12
514	Zinc	485	138	152	1213	210	353
601	Total Cyanides	6	4	0	146	0	5
602	Total Phenols	38	20	42	377	0	96
703	Ammonia	5	9	17	5	0	8
704	Oil and Grease	66	32	93	151	0	28
705	TSS	213	138	167	323	0	140
706	TOC	60	65	190	183	5	68
707	COD	246	263	535	804	0	190
708	BOD	82	82	249	334	0	103
	Number of Sites	2	2	2	3	-	-
	Number of Samples	6	6	6	9	2	3

*Relative flows for the R. M. Clayton basin: Residential, 61%, Commercial/Downtown, 21%; Industrial, 18%

**Classicals in mg/L

influent concentrations than seen previously. Most pollutants are observed at their highest levels in the industrial sites, except for trichloroethylene, which is high downtown and pentachlorophenol, which is at comparable levels in the downtown, commercial, and industrial sites.

The tap water source has a higher level of zinc (210 µg/L) than seen previously (Cincinnati = 27 µg/L, St. Louis = 14 µg/L), but otherwise is similar to taps from the previous cities. The highest levels of chloroform were observed in the tap water samples.

As mentioned, the concentration data only provide certain clues as to possible particular sources of pollutants. They also provide a perspective on the matter of whether pollutants observed at the POTW are also observed in the sources and vice versa.

The most complete analysis of this data is performed when the flow and concentration data are combined to project a total mass flow.

C. Mass Balance Analysis

1. Calculations for Scale Up

The objectives of this study include being able to predict the relative mass contribution of residential and commerical sources to POTW influents. One reason for doing this is to determine the industrial contribution at any given POTW by measurement of the influent. The total mass flow to the POTW for any pollutant may be expressed as:

$$\mathrm{POTW} = \mathrm{RES} + \mathrm{COM} + \mathrm{IND}$$

representing the total mass flow (e.g., in Kg/day) to the POTW from each of the three major source categories. Thus, for any city, Q, if the total contribution from the residential and commercial sources can be estimated, then the industrial contribution can be calculated after measuring the POTW as follows:

$$\mathrm{IND}_Q = \mathrm{POTW}_Q - (\mathrm{RES}_Q + \mathrm{COM}_Q)$$

One means of checking the validity of the data, as it is being developed, is to carry out a mass balance calculation for the city, (X), being studied by adding the relative contributions from each source type for comparison with the POTW:

$$\text{POTW}_x = \text{RES}_x + \text{COM}_x + \text{IND}_x$$

These goals could be attained if it were possible to determine an average index value (V) for each source category which could be scaled up for each POTW basin according to the relative amount of each type of source activity in the basin (A). In the general case, the equation would take the form

$$\text{POTW} = V_R \bullet A_R + V_C \bullet A_C + V_I \bullet A_I$$

indicating the quantitites of each source type (R = RES, C = COM, I = IND).

The basic data available from each sampling site to use in developing this approach are concentration, flow, and population. For the POTW drainage basin as a whole, it is usually possible to obtain reliable estimates of total population (from the land planning agency) and total commercial and industrial flow (from the water use records).

For the residential sites, it is reasonable to use the population as an index basis. Thus, for the residential sites, a per capita discharge rate can be calculated as follows:

$$\text{mass/person/day} = \frac{\text{concentration} \bullet \text{flow}}{\text{population}}$$

For reporting convenience, the residential values have been developed in units of mg/person/day. The total basin residential contribution may thus be estimated as:

$$\text{RES(Kg/day)} = \text{Res. Avg.(mg/person/day)} \bullet \text{Basin Population} \bullet 10^{-6}$$

For the commercial and industrial sites, the only parameter reliably available for all of the sites studied (and the basin) is the total flow. Thus, for these source types, an average concentration value has been calculated so that, when the average value is multiplied by the total basin source type flow, the total source contribution is obtained:

$$\text{COM(Kg/day)} = [\text{Avg. Com. Conc.}(\mu g/L)] \bullet [\text{Com. Flow}(L/S)] \bullet 8.64 \times 10^{-5}$$

$$\text{IND(Kg/day)} = [\text{Avg. Ind. Conc.}(\mu g/L)] \bullet [\text{Ind. Flow}(L/S)] \bullet 8.64 \times 10^{-5}$$

The data obtained from the commercial sites do not show a wide range in type or quantity of pollutants between sites and suggest that an average commercial concentration is a valid concept. To the contrary, the industrial site data show a wide variance in both type and concentration of pollutants, indicating that an average industrial concentration is not a valid concept to be applied generally. It is useful, however, within a basin to calculate this value so that a mass balance comparison between the sources and POTW can be made. Such a comparison provides a test of how well the sites sampled represent the quantity and qualitative nature of the whole of that source type within the basin.

Table 12 summarizes the basic characteristics of each of the sampling sites, giving the relative flow contribution from the three main source types, population, and average measured flow.

In Table 13 are shown the per capita mass discharge rates calculated for each of the residential sources and the population weighted average value. The average concentration values for the commercial and industrial sources are given in Tables 14 and 15, respectively. The values for the individual sites are flow-weighted averages; the last column on the right represents a straight mean of the individual site averages. These values may differ slightly from those presented in Table 11 since those values were all straight arithmetic averages rather than flow-weighted averages.

The average index values may be used to calculate, on the basis of the approach discussed above, the total mass flow from each of the

Table 12

SUMMARY OF SITE CHARACTERISTICS

Name	Designation	Sources		Relative Flow %			Population	Measured Flow (Lps)
		Combined	Separate	RES	COM	IND		
Warren	Residential		X	100	0	0	2,416	9.0
Northside	Residential		X	73	27	0	10,280	103.6
Lenox	Commercial		X	21	79	0	1,852	20.2
DeKalb	Commercial		X	72	26	2	1,868	6.8
Sixteenth	Commercial/ Downtown	X		18	42	41	12,810	234.0
Peachtree	Commercial/ Mixed	X		31	45	24	52,546	1602.0
Surrey	Industrial		X	3	4	93	400	41.6
DeFoors	Industrial	X		11	12	77	1,951	82.2
Ensign	Industrial		X	36	43	20	3,533	54.1
POTW	BASIN						385,425	4072.0

Table 13

RESIDENTIAL SOURCE PER CAPITA VALUES

		mg/person/day*		
	Pollutant	NORTHSIDE	WARREN	POPULATION WEIGHTED AVERAGE
110	1,1-Dichloroethylene	.00	.00	.00
111	1,1-Dichloroethane	.00	.00	.00
112	Trans-1,2-Dichloroethylene	.00	.00	.00
113	Chloroform	2.36	1.51	2.20
114	1,2-Dichloroethane	.00	.00	.00
115	1,1,1-Trichloroethane	.82	.00	.66
116	Carbon tetrachloride	.00	.00	.00
120	Trichloroethylene	1.32	.00	1.07
121	Benzene	.00	.00	.00
127	1,1,2,2-Tetrachloroethylene	5.52	.63	4.59
128	Toluene	.86	.15	.72
129	Chlorobenzene	.00	.00	.00
130	Ethyl benzene	.00	.09	.02
203	Phenol	.00	1.65	.31
204	2,4-Dimethylphenol	.00	1.19	.23
210	Pentachlorophenol	6.20	.00	5.02
301	Dichlorobenzenes	.00	.00	.00
315	Naphthalene	.00	.00	.00
333	Di-n-butyl phthalate	.00	1.61	.31
337	Butyl benzyl phthalate	.00	.00	.00
338	Bis(2-ethylhexyl)phthalate	.00	.00	.00
501	Antimony	.00	.61	.12
502	Arsenic	.00	.00	.00
504	Cadmium	.00	.51	.10
505	Chromium	15.51	2.26	12.99
506	Copper	24.68	14.29	22.71
507	Lead	26.68	13.42	24.16
508	Manganese	115.55	79.44	108.68
509	Mercury	.00	.00	.00
510	Nickel	1.90	1.79	1.88
512	Silver	3.52	.00	2.85
514	Zinc	85.55	66.94	82.01
601	Total cyanides	4.81	.00	3.89
602	Total phenols	13.08	6.69	11.87
703	Ammonia	5.84	2.90	5.28
704	Oil and Grease	18.73	10.96	17.25
705	TSS	49.30	94.98	58.00
706	TOC	37.83	23.99	35.19
707	COD	231.63	58.90	198.76
708	BOD	48.55	29.13	44.86

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*Classicals in g/person/day

Table 14

COMMERCIAL AVERAGE CONCENTRATIONS

		µg/L*				
	Pollutant	LENOX	DEKALB	PEACHTREE	SIXTEENTH	STRAIGHT AVERAGE
110	1,1-Dichloroethylene	.0	.0	.0	.0	.0
111	1,1-Dichloroethane	.0	.0	.0	.0	.0
112	Trans-1,2-dichloroethylene	2.0	9.2	.0	2.2	3.3
113	Chloroform	6.6	16.2	3.5	6.4	8.2
114	1,2-Dichloroethane	.0	.0	.0	.0	.0
115	1,1,1-Trichloroethane	2.4	1.7	2.1	.0	1.6
116	Carbon tetrachloride	.0	.0	.0	1.1	.3
120	Trichloroethylene	.0	73.0	163.3	80.9	79.3
121	Benzene	.0	.0	.7	1.3	.5
127	1,1,2,2-Tetrachloroethylene	9.5	81.6	10.1	2.6	26.0
128	Toluene	2.1	4.3	3.9	1.1	2.8
129	Chlorobenzene	.0	.0	.6	.0	.1
130	Ethyl benzene	5.9	.0	4.1	.0	2.5
203	Phenol	3.5	6.6	.0	.0	2.5
204	2,4-Dimethylphenol	.0	.0	.0	.0	.0
210	Pentachlorophenol	41.5	.0	14.4	27.8	20.9
301	Dichlorobenzenes	.0	7.0	.0	.0	1.8
315	Naphthalene	.0	.0	.0	.0	.0
333	Di-n-butyl phthalate	4.6	.0	.0	4.5	2.3
337	Butyl benzyl phthalate	.0	33.0	.0	.0	8.2
338	Bis(2-ethylhexyl)phthalate	.0	20.5	.0	.0	5.1
401	Antimony	.5	.0	.0	.6	.3
502	Arsenic	.0	.0	.0	.0	.0
504	Cadmium	.0	.0	.0	.0	.0
505	Chromium	423.8	6.6	59.5	113.1	150.7
506	Copper	51.3	52.2	71.0	45.2	54.9
507	Lead	49.3	38.7	352.7	108.6	137.3
508	Manganese	178.2	154.9	324.4	183.7	210.3
509	Mercury	.0	.0	.0	.0	.0
510	Nickel	5.5	18.3	28.8	8.7	15.3
512	Silver	9.1	.0	13.1	12.8	8.8
514	Zinc	171.9	134.5	785.9	172.7	316.3
601	Total cyanides	.0	.0	11.1	.0	2.8
602	Total phenols	43.5	40.5	38.2	36.0	39.5
703	Ammonia	22.6	5.6	5.7	4.3	9.5
704	Oil and Grease	123.8	69.6	60.3	62.0	78.9
705	TSS	121.3	163.6	222.9	201.2	177.2
706	TOC	180.3	184.0	55.3	60.6	120.1
707	COD	401.4	666.6	358.9	131.0	389.4
708	BOD	245.4	262.6	79.1	78.8	166.5

*Classicals in mg/L

Table 15

INDUSTRIAL AVERAGE CONCENTRATIONS (μg/L)

		μg/L*			
	Pollutant	SURREY	DEFOORS	ENSIGN	STRAIGHT AVERAGE
110	1,1-Dichloroethylene	3.0	49.2	17.3	23.2
111	1,1-Dichloroethane	1.0	7.9	.6	3.1
112	Trans-1,2-dichloroethylene	.1	56.8	13.0	23.3
113	Chloroform	5.0	19.6	7.5	10.7
114	1,2-Dichloroethane	.0	1.9	1.6	1.2
115	1,1,1-Trichloroethane	73.2	252.0	173.4	166.2
116	Carbon tetrachloride	14.8	151.7	3.2	56.6
120	Trichloroethylene	4.0	67.6	18.2	29.9
121	Benzene	.8	1.8	1.0	1.2
127	1,1,2,2-Tetrachloroethylene	123.9	204.8	43.5	124.1
128	Toluene	123.8	63.3	74.2	87.1
129	Chlorobenzene	.0	5.6	.0	1.9
130	Ethyl benzene	258.3	228.9	111.9	199.7
203	Phenol	551.8	232.5	19.8	268.0
204	2,4-Dimethylphenol	301.3	130.9	11.6	147.9
210	Pentachlorophenol	9.2	51.3	.0	20.1
301	Dichlorobenzenes	.0	2187.7	5.2	731.0
315	Naphthalene	194.9	78.6	.0	91.2
333	Di-n-butyl phthalate	42.7	90.4	.0	44.4
337	Butyl benzyl phthalate	604.0	.0	377.3	327.1
338	Bix(2-ethylhexyl)phthalate	173.7	84.1	.0	85.9
501	Antimony	-	-	-	-
502	Arsenic	2.0	8.5	.0	3.5
504	Cadmium	17.1	1.7	83.5	34.1
505	Chromium	1880.6	2136.9	33.0	1350.1
506	Copper	75.4	163.0	342.5	193.6
507	Lead	1224.5	365.2	91.4	560.3
508	Manganese	165.5	388.1	441.2	331.6
509	Mercury	1.8	5.9	3.4	3.7
510	Nickel	596.7	22.1	8.8	209.2
512	Silver	8.3	25.7	13.6	15.9
514	Zinc	3356.0	493.4	148.7	1332.7
601	Total cyanides	236.4	48.8	172.4	152.5
602	Total phenols	446.1	514.7	181.5	380.8
703	Ammonia	3.6	8.4	4.1	5.4
704	Oil and Grease	430.7	103.4	62.0	198.7
705	TSS	434.1	550.9	91.5	358.8
706	TOC	196.3	273.4	133.9	201.2
707	COD	1350.3	1068.0	318.2	912.2
708	BOD	388.8	524.9	207.1	373.6

*Classicals in mg/L

source types within the drainage basin according to the equation below:

$$\text{SUM} = \text{RES} \bullet \text{Population} + \text{COM} \bullet \text{Flow}_C + \text{IND} \bullet \text{Flow}_I$$

where RES, COM and IND indicate the average value either on a per capita or concentration basis, population refers to the total drainage basin population, and Flow_C and Flow_I are, respectively, the total commercial and industrial flows in the basin. The values thus calculated may be compared with the POTW influent as shown in Table 16.

It has been estimated that the combined uncertainty in each of the source concentration and flow measurements, as well as in the pair of influent measurements, amounts to about a factor of two. That is, in making comparisons between SUM and INF within the error limits of the analysis, pollutants for which the INF/SUM ratios fall in the range of 0.5-2.0 are considered to have agreement between their projected source total (SUM) and the POTW influent (INF). The usefulness of this mass balance analysis is primarily in evaluating how well the sources sampled represent the total source distribution in the basin and in providing a measure of the reliability in using the individual index values in the overall multi-city evaluation.

The data in Table 16 are grouped according to those pollutants whose SUM matches the POTW influent (INF), those that are higher in the influent than projected from the sum of the sources, and those that are higher in the sources than observed in the influent. For convenience, the mass values are expressed in Kg/day, except for the classicals, which are in 10^3 Kg/day. Some of the INF/SUM ratios in Table 16 are shown in parentheses ( ) to indicate that the INF value is probably too low to allow for a meaningful comparison. The significance of the influent measurement has been determined with respect to the reporting limit of the pollutant in question. A value of 0.35 Kg/day at the influent flow of 4072 LpS corresponds to a concentration of 1 μg/L; 3.5 Kg/day equals 10 μg/L.

Table 16

MASS BALANCE ANALYSIS

		Kg/day*					INF
		RES	COM	IND	SUM	INF**	SUM
	Pollutants whose **source** values account for influent, $0.5 \leq INF/SUM \leq 2.0$						
113.	Chloroform	0.85	0.71	0.68	2.23	2.51	1.1
114.	1,2-Dichloroethane	0.00	0.00	0.07	0.07	0.14	(2.0)
128.	Toluene	0.28	0.18	5.49	5.95	8.97	1.5
130.	Ethyl Benzene	0.01	0.14	12.58	12.73	17.15	1.4
210.	Pentachlorophenol	1.94	1.69	1.27	4.89	6.75	1.4
301.	Dichlorobenzenes	0.00	0.17	46.03	46.20	32.62	0.7
315.	Naphthalene	0.00	0.00	5.74	5.74	11.56	2.0
333.	Di-n-butyl Phthalate	0.12	0.22	2.79	3.13	1.55	(0.5)
337.	Butyl Benzyl Phthalate	0.00	0.80	20.60	21.40	27.18	1.3
504.	Cadmium	0.04	0.00	2.15	2.19	1.10	0.5
506.	Copper	8.75	3.63	12.19	24.57	17.71	0.7
507.	Lead	9.31	4.79	35.29	49.39	47.72	1.0
508.	Manganese	41.89	12.61	20.89	75.38	97.63	1.3
509.	Mercury	0.00	0.00	0.23	0.23	0.28	(1.2)
512.	Silver	1.10	0.53	1.00	2.63	4.37	1.7
514.	Zinc	31.61	11.69	83.93	127.22	124.26	1.0
602.	Total Phenols	4.57	2.93	23.98	31.48	35.13	1.1
703.	Ammonia	2.03	0.79	0.34	3.17	2.61	0.8
705.	TSS	22.35	11.86	22.60	56.81	48.51	0.8
706.	TOC	13.56	10.37	12.67	36.60	23.88	0.6
708.	BOD	17.29	14.31	23.53	55.13	35.49	0.6
	Pollutants whose **influent** values are greater than sources, $INF/SUM > 2.0$						
110.	1,1-Dichloroethylene	0.00	0.00	1.46	1.46	3.02	2.1
112.	Trans-1,2-dichloroethylene	0.00	0.33	1.47	1.79	6.54	3.6
115.	1,1,1-Trichloroethane	0.26	0.10	10.47	10.82	33.73	3.1
120.	Trichloroethylene	0.41	3.75	1.89	6.05	58.02	9.6
127.	1,1,2,2-Tetrachloroethylene	1.77	2.29	7.81	11.87	84.21	7.1
	Pollutants whose **source** values are greater than influent, $INF/SUM < 0.5$						
203.	Phenol	0.12	0.25	16.88	17.25	6.63	0.4
204.	2,4-Dimethylphenol	0.09	0.00	9.31	9.40	3.48	0.4
505.	Chromium	5.01	13.26	85.03	103.29	25.37	0.2
510.	Nickel	0.73	0.79	13.18	14.69	6.45	0.4
601.	Total Cyanides	1.50	0.00	9.60	11.10	1.73	0.2
704.	Oil and Grease	6.65	6.23	12.52	25.39	10.04	0.4
707.	COD	76.61	29.24	57.44	163.30	65.03	0.4

* Classicals in 10^3 Kg/day

** For 4072 Lps influent flow 1 μg/L = 0.35 Kg/day, 10 μg/L = 3.5 Kg/day

Of the 27 priority pollutants and 6 classical parameters for which this data analysis was carried out, 21 project a total loading which is equivalent to the measured POTW influent within the error limits, including 9 organics, 7 metals, 4 classical parameters, and total phenols.

Five pollutants have projected source levels which are less than the influent. These are all organic chlorinated solvents and may have significant sources in areas not included in the sampling plan. Five priority pollutants (2 organics, 2 metals, and total cyanides), COD, and oil and grease have projected source values greater than observed in the influent, suggesting that the rest of the basin is not proportionally as high in these chemicals as the sampled areas.

The six pollutants listed below have projected source levels, but not influent levels, greater than 0.01 Kg/day. Only carbon tetrachloride and bis(2-ethylhexylphthalate) are at high enough levels in any of the sources to be considered significant.

Pollutant		Kg/day			
		RES	COM	IND	SUM
111.	1,1-Dichloroethane	0.00	0.00	0.20	(0.20)
116.	Carbon Tetrachloride	0.00	0.03	3.56	3.59
121.	Benzene	0.00	0.03	0.08	(0.11)
129.	Chlorobenzene	0.00	0.00	0.12	(0.12)
338.	Bis(2-ethylhexyl)phthalate	0.00	0.50	5.41	5.91
502.	Arsenic	0.00	0.00	0.22	(0.22)

2. Sources of Pollutants

The relative pollutant contribution of the different source types may be examined by calculating, from the scaled mass data, the fraction contributed by each source type. For this analysis, the individual scaled RES, COM and IND Kg/day values were divided by the SUM as shown in Table 17. The reader is cautioned that such an analysis assumes that the entire basin is as represented by the sources, an observation we know from the previous discussion to be not entirely true. It would perhaps be better to view the data in Table 17 as representative of a

Table 17

SOURCES OF POLLUTANTS

	Fraction of Scaled Sum Mass		
Pollutant	RES	COM	IND
Residential sources contribute more than 50% of mass			
508. Manganese	0.56	0.17	0.28
703. Ammonia	0.64	0.25	0.11
707. COD	0.47	0.18	0.35
Commercial sources contribute more than 50% of mass			
120. Trichloroethylene	0.07	0.62	0.31
Industrial sources contribute more than 50% of mass			
110. 1,1-Dichloroethylene	0.00	0.00	1.00
111. 1,1-Dichloroethane	0.00	0.00	(1.00)
112. Trans-1,2-dichloroethylene	0.00	0.18	0.82
114. 1,2-Dichloroethane	0.00	0.00	(1.00)
115. 1,1,1-Trichloroethane	0.02	0.01	0.97
116. Carbon Tetrachloride	0.00	0.01	0.99
121. Benzene	0.00	0.29	(0.71)
127. 1,1,2,2-Tetrachloroethylene	0.15	0.19	0.66
128. Toluene	0.05	0.03	0.92
129. Chlorobenzene	0.00	0.00	(1.00)
130. Ethyl Benzene	0.00	0.01	0.99
203. Phenol	0.01	0.01	0.98
204. 2,4-Dimethyl Phenol	0.01	0.00	0.99
301. Dichlorobenzenes	0.00	0.00	1.00
315. Naphthalene	0.00	0.00	1.00
333. Di-n-butyl Phthalate	0.04	0.07	0.89
337. Butyl Benzyl Phthalate	0.00	0.04	0.96
338. Bis(2-ethylhexyl)Phthalate	0.00	0.08	0.92
502. Arsenic	0.00	0.00	(1.00)
504. Cadmium	0.02	0.00	0.98
505. Chromium	0.05	0.13	0.82
506. Copper	0.36	0.15	0.50
507. Lead	0.19	0.10	0.71
509. Mercury	0.00	0.00	(1.00)
510. Nickel	0.05	0.05	0.90
504. Zinc	0.25	0.09	0.66
601. Total Cyanides	0.14	0.00	0.86
602. Total Phenols	0.15	0.09	0.76
704. Oil and Grease	0.26	0.25	0.49

Table 17 (Cont'd)

SOURCES OF POLLUTANTS

Pollutant		Fraction of Scaled Sum Mass		
		RES	COM	IND
	Pollutants with no dominant source			
113.	Chloroform	0.38	0.32	0.30
210.	Pentachlorophenol	0.40	0.35	0.26
512.	Silver	0.42	0.20	0.38
705.	TSS	0.39	0.21	0.40
706.	TOC	0.37	0.28	0.35
708.	BOD	0.31	0.26	0.43

hypothetical drainage basin whose pollutant load was as represented in the R. M. Clayton sites, but scaled up based upon the relative source type flows for the basin (these are RES = 61.3%, COM = 20.8%, IND = 17.9%).

Of the 33 pollutants in this table, 29 are dominated (more than 50% of the mass) by the industrial sources, including 18 organics, 8 metals, total cyanides, total phenols, and oil and grease. Only manganese, ammonia and COD are dominated by the residential sources. Commercial sources are the dominant source of trichloroethylene. Three priority pollutants (chloroform, pentachlorophenol, silver) and three classical parameters (TSS, TOC, BOD) do not appear to have a single dominant source. These data are a clear contrast to the St. Louis study where the residential sources dominated the projected influent values because of the small industrial component in that study.

It should be emphasized that an analysis of this type is only meaningful within the ability to obtain closure with respect to the mass balance. As seen from Table 17, several pollutants are higher and/or lower in their projected sums than what was actually observed at the influent due to the fact that the R. M. Clayton drainage basin is not identical in source composition to the scale-up of the individual sites. An analysis of this type will be more meaningful when the data from the source types in all of the cities are compared.

3. Tap Water Contribution

The potential contribution of tap water to the pollutant load at the POTW may be estimated from the measured tap water concentrations with the assumption that the tap water flow is equal to the influent flow. Such a flow estimate will be in error by the amount of inflow and infiltration in the system, data for which were unavailable for this study. Table 18 shows the calculated mass flows for the tap water, compared with influent values. This analysis shows that the tap water could be a significant source of chloroform. All other pollutants observed in the tap water constitute only a small fraction of the measured influent mass.

Table 18

POSSIBLE TAP WATER CONTRIBUTION TO POTW INFLUENT

		Kg/day*		TAP
	Pollutant	**INF**	**TAP**	**INF**
113.	**Chloroform**	2.51	7.56	3.0
127.	**1,1,2,2-Tetrachloroethylene**	84.2	0.53	0.01
506.	**Copper**	17.7	7.92	0.4
507.	**Lead**	47.7	4.57	0.1
508.	**Manganese**	97.6	2.29	0.02
510.	**Nickel**	6.45	1.41	0.2
514.	**Zinc**	124.3	73.9	0.6
706.	**TOC**	23.9	1.58	0.07

* Classicals in 10^3 Kg/day

D. Review of Unusual Occurrences

The data for the individual samples have been reviewed to determine whether there were any particular patterns evident in the pollutants which showed up at low frequency, i.e., less than three times. Most of the infrequently observed pollutants seem to appear without pattern. Three of the chlorophenols, which appeared only once, did occur together at the DeFoors industrial site. They were:

	conc. (μg/L)
2-chlorophenol	15
2,4-dichlorophenol	15
2,4,6-trichlorophenol	12

A similar observation had been made in St. Louis, where a sample had been observed to have an excess of free chlorine. This DeFoors sample did not give a positive chlorine test but as slightly basic.

VII. CONCLUSIONS

Completion of this study of the third, and most diverse, drainage basin has introduced a substantial amount of data. The third city provides an extended data base with which to compare the data obtained in the previous basins. In addition, since the sampling areas in Atlanta were so much more complex, in terms of their chemical activity, they provided a more complete basis for estimating the typical pollutant load from commercial and industrial sources. The Peachtree site in Atlanta was largely composed of the downtown commercial area, including many of the hotels. This area showed surprisingly low pollutant concentrations in view of the demographic data. In fact, this area did not differ greatly from the other commercial and residential areas sampled to date. The industrial sites generally exhibited higher pollutant concentrations; there were also five new chemicals detected in these industrial samples.

In the R. M. Clayton drainage basin, 49 priority pollutants (or pollutant groups) were observed: 35 organics, 11 metals plus manganese, total cyanides and total phenols. The six classical parameters measured in this study - ammonia, TSS, TOC, COD, BOD, and oil and grease - were also detected. Eight (8) organics, 7 metals, and total phenols were observed more than 50% of the time (16 samples); 5 of the metals were observed 100% of the time. Two organic pollutants - chloroform and 1,1,2,2-tetrachloroethylene - were detected in 90-100% of the samples, as they were in St. Louis. There were 77 individual priority pollutants (including all the pesticides) which were not detected in any of the samples.

The concentration data and frequency data only address the question of whether or not the pollutants were found at the sources sampled. A more complete insight into which sources are responsible for the pollutant load at the POTW may be gained by scaling the source contributions up to represent the total basin distribution of residential, commercial, and industrial flows. This has been done in terms of Kg/day for all pollutants detected more than three times and the major conclusions are summarized below:

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- 17 pollutants - 9 organics, 7 metals and total phenols - project a total pollutant load equivalent to the measured influent; 4 classical parameters are also accounted for by the sources.
- Five (5) pollutants (all chlorinated solvents) have projected source levels less than the influent indicating that an unsampled source of these pollutants is likely; 5 pollutants (2 organics, 2 metals, and total cyanides), COD and oil and grease have total source values greater than the influent. These observations are summarized in Table 16.
- By comparing the scaled Kg/day values for the three source categories as fractions of the sum, the following assignments can be made: trichloroethylene was contributed predominantly by commercial sources; 28 priority pollutants and oil and grease by industrial sources; manganese, ammonia and COD by residential sources; and 3 priority pollutants and 3 classical parameters by no source category in particular (although chloroform was primarily due to the tap water). These results are summarized in Table 17.
- All the pollutants whose influent values are greater than the projected source levels, except trichloroethylene, are contained in the list of chemicals attributed to industrial sources; 31% of the trichloroethylene is due to industrial sources but the major source is commercial activity.

The chemical analysis procedures have been improved for some pollutants. The quality control program continues to be invaluable in terms of daily checks on the chemical analyses and in terms of establishing the reliability of the data for subsequent calculations and projections.

The selection and isolation of sampling areas containing only one type of source activity, i.e., residential, commercial or industrial, continues to be problematic. The collection system bears little resemblance to the surface zoning and the system maps frequently are not complete relative to direction of flow and location of manholes. A great deal of site preparation must be put into accurately locating areas whose land use is satisfactory for source type characterization.

VIII. REFERENCES

1. "Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants," U.S. EPA, EMSL, Cincinnati, Ohio, March 1977, revised April 1977.

2. "Quality Assurance Program for the Analyses of Chemical Constituents in Environmental Samples," U.S. EPA, EMSL, Cincinnati, Ohio, March 1978.

3. "Sources of Toxic Pollutants Found in Influents to Sewage Treatment Plants," I. Literature Review, EPA, MDSD, Final Report on Task Order No. 6, Contract No. 68-01-3857, Report No. ADL 81099-50, June 1979.

4. "Sources of Toxic Pollutants Found in Influents to Sewage Treatment Plants," II. Muddy Creek Drainage Basin, Cincinnati, Ohio, EPA, MDSD, Final Report on Task Order No. 6, Contract No. 68-01-3857, Report No. ADL 81099-51, June 1979.

5. "Sources of Toxic Pollutants Found in Influents to Sewage Treatment Plants," III. Coldwater Creek Drainage Basin, St. Louis, Missouri, EPA, MDSD, Final Report on Task Order No. 10, Contract No. 68-01-3857, Report No. ADL 81099-16, October 1979.

6. "Sources of Toxic Pollutants Found in Influents to Sewage Treatment Plants," V. Hartford Water Pollution Control Plant, Hartford, Connecticut, EPA, MDSD, Final Report on Task Order No. 13, Contract No. 68-01-3857, Report No. ADL 81099-46, November 1979.

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APPENDIX A

DETAILS ON SAMPLING PROCEDURES

On April 1, 1979, 14 employees of Arthur D. Little went to Atlanta to obtain wastewater samples from sewers within the R. M. Clayton sewage district. These employees were under the immediate supervision of Jeffrey Adams and Marie Chung.

Actual sampling activities began on Tuesday, April 3, at approximately 8:00 a.m., and continued until Monday, April 10, at 8:00 a.m. Throughout this period of time, six teams of Arthur D. Little employees were on duty at all hours of the day and night. Four of these teams were actively engaged in sample collection at each of the ten sampling sites that we identified, while two teams provided logistical backup and, to a limited extent, participated in the collection of samples, i.e., at the POTW.

At any given time, three teams were on duty; one stationed at the R. M. Clayton plant, with the remaining two teams rotating between field sites. After twelve hours, each of the three teams were replaced by a fresh team as work continued.

The two rotating field teams were responsible for collecting samples at four-hour intervals from each of the following locations:

Town/City	Site	Description
Atlanta	Northside	New residential
North Atlanta	Warren	Old residential
Atlanta	Lenox	Commercial
Doraville	DeKalb	Commercial
Atlanta	Peachtree	Mixed
Atlanta	Sixteenth	Commercial
Chamblee	Ensign	Industrial
Chamblee	Sexton	Industrial
Doraville	Surrey	Industrial
Atlanta	DeFoors	Industrial

To accomplish this, the two field teams drove through the drainage area in rented 12-foot trucks containing all the supplies necessary to accomplish the job. As each team finished its shift, the truck returned to the POTW for supplies and sample drop-off. From this point, the logistics crew was responsible for the logging in and packaging of all collected samples prior to their shipment to our laboratory. In addition, the logistics teams collected samples of the POTW influent and a tap water sample.

A summary of the 48-hour composite samples collected in Atlanta is given in Table A-1. Sampling schedules, as well as the minimum number and size of collection bottles required by each team, have been summarized in Tables A-2 and A-3. In addition, the sampling plans utilized for QC samples, regular samples, and blanks have been outlined in Table A-4 through A-6.

All samples were taken by the Manual Sampling Collection method in Table A-7 and preserved according to the requirements in Table A-8.

Table A-9 is a summary of the average daily flows measured at each of the sampling locations in Atlanta, corrected as discussed in Section IV of this report.

Table A-1

SUMMARY OF 48-HOUR COMPOSITES COLLECTED

Site and Description	Day A		Day B		Day C		
	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	
Tap Water	X	X			X	X	12 Increments
POTW Influent	X	X	X	X	X	X	12 Increments
Northside: New Residential	X	X	X	X	X	X	12 Increments
Lenox: Commercial	X	X	X	X	X	X	12 Increments
Peachtree: Mixed	X	X	X	X	X	X	12 Increments
Sixteenth: Commercial	X	X	X	X	X	X	12 Increments
DeFoors: Industrial	X	X	X	X	X	X	12 Increments
Field Blank					X	X	12 Increments
DeKalb: Commercial	X	X	X	X	X	X	12 Increments
Surrey: Industrial	X	X	X	X	X	X	12 Increments
Ensign*: Industrial	X	X	X	X	X	X	12 Increments
Sexton*: Industrial	X	X	X	X	X	X	12 Increments
Warren: Old Residential	X	X	X	X	X	X	12 Increments
Field Blank					X	X	12 Increments

*Increments from Ensign and Sexton were combined to produce one sample.

Table A-2

SAMPLING SCHEDULE IN ATLANTA (Logistics)

SAMPLE LOCATION						
	TUESDAY, WEDNESDAY, SATURDAY, SUNDAY					
Influent (INF)	0900	1300	1700	2100	0100	0500
Tap Water (TAP)	0930	1330	1730	2130	0130	0530
	THURSDAY, FRIDAY					
Influent (INF)	0900	1300	1700	2100	0100	0500

Table A-2 (cont'd)

SAMPLING SCHEDULE IN ATLANTA (North)

SAMPLE LOCATION	TEAM 2 in 0700; out 2000: TEAM 4 in 1900: out 0800:					
	TUESDAY, WEDNESDAY, THURSDAY, FRIDAY					
DeKalb (NDD)	0800	1200	1600	2000	0000	0400
Surrey (SC)	0900	1300	1700	2100	0100	0500
Ensign (END) and Sexton (SWX)	1000	1400	1800	2200	0200	0600
Warren (WHL)	1100	1500	1900	2300	0300	0700
	SATURDAY, SUNDAY					
DeKalb (NDD)	0800	1200	1600	2000	0000	0400
Surrey (SC)	0900	1300	1700	2100	0100	0500
Field Blank (FB-1)	0930	1330	1730	2130	0130	0530
Ensign (END) and Sexton (SWX)	1000	1400	1800	2200	0200	0600
Warren (WHL)	1100	1500	1900	2300	0300	0700

Table A-2 (cont'd)

SAMPLING SCHEDULE IN ATLANTA(SOUTH)

SAMPLE LOCATION	TEAM 1 IN: 0700 OUT: 2000			Team 3 IN: 1900 OUT: 0800		
	TUESDAY, WEDNESDAY, THURSDAY, FRIDAY					
Northside (NSP)	0800	1200	1600	2000	2400	0400
Lenox (LS)	0845	1245	1645	2045	0045	0445
Sixteenth (SIX)	0930	1330	1730	2130	0130	0530
Peachtree (PEA)	1015	1415	1815	2215	0215	0615
DeFoors (DFR)	1100	1500	1900	2300	0300	0700
	SATURDAY, SUNDAY					
Northside (NSP)	0800	1200	1600	2000	2400	0400
Lenox (LS)	0845	1245	1645	2045	0045	0445
Sixteenth (SIX)	0930	1330	1730	2130	0130	0530
Field Blank (FB-2)	0945	1345	1745	2145	0145	0545
Peachtree (PEA)	1015	1415	1815	2215	0215	0615
DeFoors (DFR)	1100	1500	1900	2300	0300	0700

Table A-3

MINIMUM NUMBER AND SIZE OF BOTTLES REQUIRED BY LOGISTICS AT EACH SITE

SAMPLING SITE	DAY					
	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Influent (INF)	5 x 1L* 1 x 500mL 1 x 250mL 1 x 45mL	5 x 1L* 1 x 500mL 1 x 250mL 1 x 45mL	8 x 1L* 1 x 45mL (QC)	8 x 1L* 1 x 45mL (QC)	5 x 1L* 1 x 500mL 1 x 250mL 1 x 45mL	5 x 1L* 1 x 500mL 1 x 250mL 1 x 45mL
Tap (TAP)	4 x 1L* 1 x 500mL 1 x 250mL 1 x 45mL	4 x 1L* 1 x 500mL 1 x 250mL 1 x 45mL	not collected	not collected	4 x 1L* 1 x 500mL 1 x 250mL 1 x 45mL	4 x 1L* 1 x 500mL 1 x 250mL 1 x 45mL

Table A-3 (cont'd)

MINIMUM NUMBER AND SIZE OF BOTTLES REQUIRED BY TEAMS 1 & 3 AT EACH SITE DURING EACH VISIT

SAMPLING SITE	DAY					
	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Northside (NSP)	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	← SAME AS TUESDAY & SUNDAY →				5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml
Lenox (LS) Sixteenth (SIX)	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	← SAME AS TUESDAY & SUNDAY →				5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml
Peachtree (PEA)	8 x 1L 1 x 45ml (QC)	8 x 1L* 1 x 45ml (QC)	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	← same as Thurs. and Sunday →		5 x 1L 1 x 500ml 1 x 250ml 1 x 45ml
DeFoors (DFR)	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	8 x 1L* 1 x 45ml (QC)	8 x 1L* 1 x 45ml (QC)	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml
FIELD BLANK (FB-1)	not collected	not collected	not collected	not collected	4 x 1L* 1 x 500ml 1 x 250ml 5 x 45ml**	4 x 1L* 1 x 500ml 1 x 250ml

*This includes the 1L bottles for Oil & Grease fraction that only has to be collected twice each day (one by each team)

** All 45 ml bottles are collected by team 1 during their first field blank increment

Table A-3 (cont'd)

MINIMUM NUMBER AND SIZE OF BOTTLES REQUIRED BY TEAMS 2 & 4 AT EACH SITE DURING EACH VISIT

SAMPLING SITE	DAY					
	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
DeKalb (NDD)	8 x 1L* 1 x 45ml (QC)	8 x 1L* 1 x 45mL (QC)	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml
Surrey (SC)	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	5 x 1L 1 x 500ml 1 x 250ml 1 x 45ml	← same as Wed. and Sat. →		5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml
Ensign (END) and Sexton (SWX)	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	← same as Tuesday & Sunday →				5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml
Warren (WHL)	5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	same as Tuesday & Fri. ← →		5 x 1L* 1 x 500ml 1 x 250ml 1 x 45ml	8 x 1L* 1 x 45ml (QC)	8 x 1L* 1 x 45ml (QC)
FIELD BLANK (FB-2)	Not Collected	Not Collected	Not Collected	Not Collected	4 x 1L* 1 x 500ml 1 x 250ml 5 x 45ml**	4 x 1L 1 x 500ml 1 x 250ml

*This includes the 1L bottle for Oil & Grease that only has to be collected twice each day (one by each team)
**All 5 x 45 ml bottles are collected by Team 1 during their first field blank increment

Table A-4

PLAN A-1. Each time a non-QC'd sample is withdrawn from a manhole at one of the field sampling locations, the following number and size of bottles are to be filled:

Northside (NSP)
Lenox (LS)
Sixteenth (SIX)
DeKalb (NDD)
Sexton (SWX)
Ensign (END)

Fraction	Collect	Code
For Acid/Base Neutral and Asbestos Fraction	1 x 1L	ABN/AS
For PCB/Pesticide and BOD/TSS Fraction	1 x 1L	PCB/Class BOD
For Volatile Fraction*	1 x 45 mL. Screw-cap vial. Do not leave any bubbles in bottles.	VOA

Note: These five fractions will be air-freighted to Boston daily. Be sure to pack all air freight samples separately from the other bottles.

- -

For Metal and Mercury*	1 x 1L	M+, Hg
For Cyanide Fraction*	1 x 250 mL or equivalent	CN
For Phenol Fraction*	1 x 500 mL or equivalent	Phen.
For TOC, COD and NH_3 Fraction*	1 x 1L	NH_3
For Oil and Grease Fraction*	1 x 1L	Class, O+G

Note: The oil and grease fraction is only to be collected twice each day at each site I would strongly suggest that this be done during each teams' first rotation between sites.

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*These fractions require preservation; see attached sample preservation sheet.

Table A-5

PLAN A-2. Each time a QC'd sample is withdrawn from a manhole at one of the following field locations, the following number and size of bottles are to be filled:

POTW-INF (INF)
DeFoors (DFR)

Peachtree (PEA)
DeKalb (NDD)
Warren (WHL)

Fraction	Collect	Code
For Acid/Base Neutral and Asbestos Fraction	2 x 1L	ABN/AS
For PCB/Pesticide and BOD/TSS Fraction	1 x 1L	PCB/Class BOD
For Volatile Fraction*	1 x 45 mL, screw-cap vial. Do not leave any bubbles in bottle	VOA

Note: These five fractions are air freighted to Boston daily. Be fure to segretate during field packaging.

- -

Fraction	Collect	Code
For Metal and Mercury Fraction*	1 x 1L	M+, Hg
For Cyanide Fraction*	1 x 1L	CN^-
For Total Phenol Fraction*	1 x 1L	Phen.
For NH_3, TOC, and COD Fraction*	1 x 1L	NH_3
For Oil and Grease Fraction*	1 x 1L	O+G

Note: The Oil and Grease fraction is only to be collected twice each day at each site. I would strongly recommend that this be one during each teams' first rotation between sites.

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*These samples require preservation; see attached sample preservation sheet.

Table A-6

PLAN A-3. Each time a tap water or field blank sample is collected, the following number and size of bottles should be filled:

Fraction	Collect	Code
For Acid/Base Neutral, PCB/Pesticide, BOD/TSS and Asbestos Fraction	1 x 1L	ABN, PCB, As, Class BOD
For Volatile Fraction*	5 x 45 mL screw-cap vials during first collection sequence only on field blanks	VOA
	1 x 45 mLs on tap water	VOA

Note: These five fractions are air freighted to Boston daily.

- -

For Metal and Mercury Fraction*	1 x 1L	M, Hg
For Cyanide Fraction*	1 x 250 mL or equivalent	CN
For Total Phenol Fraction*	1 x 500 mL or equivalent	Phen.
For NH_3, TOC and COD Fraction*	1 x 1L	NH_3
For Oil and Grease Fraction*	1 x 1L	O+G

Note: The Oil and Grease fraction is only to be collected twice each day at each site. I would strongly recommend that this be done during each teams' first rotation between sites.

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*These samples require preservation; see attached sample preservation sheet.

Table A-7

What to do During Manual Sample Collection

1) Gain access to the sampling location.

2) Set up page in field log notebook as per example. Use one per sample location and visit. Example: since Ensign Drive is visited three times per work shift, three separate notebook pages should be used. In addition, one or two pages should be reserved for comments about each site per shift.

3) Fill in all preliminary data in field notebook: location, collectors (initials are sufficient) time and date.

4) Using the telescoping pole and bucket, obtain a wastewater sample.

5) While keeping the contents of the bucket well mixed, measure and record the pH and temperature of the wastewater. Also test sample with potassium iodide test paper. If test is positive (paper turns blue) indicate such in field notebook. (See Attachment C)

6) Attach the sample labels to the appropriate number and size of bottles. Number and size information is given in plans A-1 through A-3.

7) Fill in all the information required on labels.

8) After labeling requirements are completed, seal the label with 2" wide scotch tape.

9) Fill all 1L bottles to the neck with sample. Preserve appropriate bottles as below. Fill VOA bottles to overflowing (except if preservative is added as per Attachment C).

10) Add preservative to each bottle that requires it (see Attachment C) i.e.:

Phenols	2mL/L H_2SO_4 plus 1 gm/L $CuSO_4.5H_2O$
Cyanides	Ascorbic acid til KI paper shows no color, plus 0.6 gm excess per liter plus 2mL/L 10N sodium hydroxide.
Metals, Mercury	5mL/L concentrated nitric acid
Total Organic Carbon COD NH_3	2mL/L concentrated sulfuric acid
Oil and Grease	2mL/L concentrated sulfuric acid
Volatiles	2 drops sodium thiosulfate solution

Table A-7 (Cont'd)

What to do During Manual Sample Collection (Continued)

11) Cover all bottle mouths (except VOAs) with Teflon film and seal with screw caps.

12) Cover all VOAs bottles with Teflon silicon septum (Teflon side towards sample). These bottles should not have any air bubbles in them!!!

13) Transcribe sample bottle number from label onto cap of bottle with yellow marker.

14) Transcribe sample bottle number and fraction identification code into field notebook.

15) Pack all bottles into ice chests. Segregate all Acid/Base Neutral, PCB/Pesticide and VOA fractions into one chest, i.e., all these fractions from all sites are stored in one chest. All other samples are stored in other chests as required.

16) Measure and record depth (cm) using dip rule and grease.

17) Determine linear velocity of water, at a point corresponding to 60% of measured depth, with the Marsh McBirney flow sensor. Record value obtained in field notebook.

18) Secure manhole and police the area for debris.

19) Move on to next sampling site.

Table A-8

Sample Preservation Requirements

Total Phenols:	For each sample bottle collected for total phenol analysis, acidify with concentrated sulfuric acid H_2SO_4 (∿ 2mL) to pH 4. Add 1 gm $CuSO_4 \cdot 5H_2O$ per liter of sample. Procedure: Check pH of raw sample with pH test paper. If needed, add 1mL conc H_2SO_4 and then check pH with test paper. Repeat until pH reaches 4. Record amount of H_2SO_4 added. Then add 1 gm/L $CuSO_4 \cdot 5H_2O$.
Cyanides:	Test each bottle collected with potassium iodide starch test paper. If color is blue, add ascorbic acid until test paper shows no color. Add 0.6 gm excess of ascorbic acid to each liter bottle collected. Then add 2mLs of 10 N sodium hydroxide.
Metals and Mercury:	Add 5mLs of concentrated nitric acid (HNO_3) to each liter bottle collected for metals. Check final pH with pH test paper. If pH < 2 stop, if pH > 2 add 1mL until pH < 2. Record extra amount of HNO_3 added.
Volatiles:	Check sample collected with potassium iodide (KI) starch indicator paper. Add two drops of sodium thiosulfate solution to each VOA bottle collected. If KI paper originally indicated positive (paper turns blue), check preserved sample again. If paper still positive, add two more drops sodium thiosulfate solution and recheck with KI paper. Record total number of drops of sodium thiosulfate solution used (if other than 2) to preserve sample. Seal bottle without any air bubbles.
Total Organic Carbon, Chemical Oxygen Demand, NH_3:	Check pH of sample with pH test paper. Add concentrated sulfuric acid (H_2SO_4) until pH < 2 (∿ 2mL). Record volume of H_2SO_4 added.
Oil and Grease:	Check pH of sample with pH test paper. Add concentrated sulfuric acid (H_2SO_4) until pH < 2 (∿ 2mL). Record volume of H_2SO_4 added.

Table A-9

ATLANTA CORRECTED FLOW VALUES

LOCATION	DAY A	DAY B	DAY C	AVG.
Northside (0.931)[*]	153.9	77.3	79.7	103.6
Warren (1.057)	12.3	7.7	7.1	9.0
Lenox (0.531)	27.9	17.9	14.8	20.2
DeKalb (0.641)	8.7	6.2	5.4	6.8
Peachtree (0.583)	1931	1478	1398	1602
Sixteenth (0.874)	297.6	184.0	219.9	233.8
Ensign (0.369) [Including Sexton(0.555)]	70.8	43.0	48.5	59.1
Surrey (0.278)	64.2	49.8	10.9	41.6
DeFoors (0.696)	106.8	84.9	55.0	82.2
Influent	4878	3747	3591	4072

[*] Velocity to manning flow correction factors

APPENDIX B

DETAILS ON ANALYTICAL METHODS

The analytical methods for each priority pollutant category have been described in the Cincinnati report.[4] The basic procedures used in this program were those described in the "Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants,"[1] and the "Quality Assurance Program for the Analyses of Chemical Constituents in Environmental Samples,"[2] U.S. EPA, Cincinnati, Ohio. Where the methods differed from those used in the Cincinnati and St. Louis surveys, brief descriptions follow. The following sections include descriptions of problems encountered, analytical information, quality control (QC) data, and comments on the method.

VOLATILES

The analytical method used for the priority pollutants in the volatiles category was modified by adding charcoal to the sorbent trap in an attempt to prevent the most volatile compounds from breaking through the trap.

During the Cincinnati and St. Louis studies, it was observed that chloromethane, dichlorodifluoromethane, bromomethane, vinyl chloride, and chloroethane were not retained by the Tenax/Silica Gel trap. EMSL-EPA suggested that adding charcoal to the trap would prevent this breakthrough. The samples were purged onto a trap consisting of 6 inches Tenax GC, 1-5/8 inch Silica Gel (35/60 mesh, Grade 15), and 1-5/8 inch charcoal desorbed at various times and temperatures. It was determined experimentally that purging for 6 minutes at 43°C and desorbing for 4 minutes at 180°C were acceptable conditions for recovering all the volatile priority pollutants, except dichlorodifluoromethane.

The relative retention times and calibration values used for volatile priority pollutant calculations are listed in Table B-1.

Table B-2 presents the volatile quality control data from the Atlanta study. Overall, the quality control (QC) data determined for the Atlanta study were comparable to the Cincinnati and St. Louis QC data.

Table B-1

CALIBRATION VALUES FOR CONCENTRATION CALCULATIONS

Volatiles

COMPOUND	RRTs[a]	slope[b]	int.[b]	Rep. Limit area	Rep. Limit µg/L
101. Chloromethane	0.136	204.08	0	.0049	1
102. Dichlorodifluoromethane	–	–	–	–	–
103. Bromomethane	0.152	232.56	0	.0093	1
104. Vinyl chloride	0.000	144.93	0	.0069	1
105. Chloroethane	0.182	243.90	0	.0041	1
106. Methylene chloride	0.268	91.74	0	.0109	1
107. Acrolein	0.000	5000	0	.0002	1
108. Trichlorofluoromethane	0.360	48.78	0	.0205	1
109. Acrylonitrile	0.385	51.55	0	.0194	1
110. 1,1–Dichloroethylene	0.412	56.50	0	.0177	1
111. 1,1–Dichloroethane	0.487	13.24	0	.0755	1
112. Trans–1,2–dichloroethylene	0.527	28.09	0	.0356	1
113. Chloroform	0.576	11.68	0	.0856	1
114. 1,2–Dichloroethane	0.617	212.76	0	.0047	1
115. 1,1,1–Trichloroethane	0.671	20.88	0	.0479	1
116. Carbon tetrachloride	0.693	24.75	0	.0404	1
117. Bromodichloromethane	0.757	212.76	0	.0047	1
118. 1,2–Dichloropropane	0.821	500	0	.0020	1
119. Trans–1,3–dichloropropylene	0.851	20.53	0	.0487	1
120. Trichloroethylene	0.876	30.40	0	.0329	2
121. Benzene	0.876	7.03	0	.1423	1
122. Cis–1,3–dichloropropylene	0.931	29.15	0	.0343	1
123. Dibromochloromethane	0.934	52.36	0	.0191	2
124. 1,1,2–Trichloroethane	0.934	29.94	0	.0334	1
125. Bromoform	1.108	69.44	0	.0144	1
126. 1,1,2,2–Tetrachloroethane	1.204	26.95	0	.0371	1
127. 1,1,2,2–Tetrachloroethylene	1.253	35.46	0	.0202	1
128. Toluene	1.305	10.88	0	.0919	1
129. Chlorobenzene	1.404	14.14	0	.0707	1
130. Ethyl benzene	1.564	33.11	0	.0302	1

[a] Retention time, relative to 2-bromo-1-chloropropane (13.95 minutes).

[b] x = concentration, y = GC/MS response

Table B-2

QUALITY CONTROL DATA

Volatiles

COMPOUND	Method Reference[a]			Raw Wastewater[b]				
	$\bar{P}$	Sp	%Sp	C	Rc	$\bar{P}$	Sp	%Sp
101. Chloromethane	330	126	38	20	10	278	83	30
102. Dichlorodifluoromethane	-	-	-	-	-	-	-	-
103. Bromomethane	170	98	58	20	17	149	82	55
104. Vinyl chloride	243	88	36	20	9	212	57	27
105. Chloroethane	185	73	39	20	9	161	40	25
106. Methylene chloride	125	26	21	20	9	73	58	80
107. Acrolein	64	60	94	100	121	53	66	125
108. Trichlorofluoromethane	143	36	25	20	2	138	41	29
109. Acrylonitrile	107	29	27	100	17	102	24	24
110. 1,1-Dichloroethylene	133	15	11	20	3	101	61	61
111. 1,1-Dichloroethane	105	28	27	20	4	93	13	14
112. Trans-1,2-dichloroethylene	93	28	30	20	5	59	43	73
113. Chloroform	102	31	30	20	7	87	19	22
114. 1,2-Dichloroethane	78	14	18	20	4	86	13	15
115. 1,1,1-Trichloroethane	90	9	10	20	4	62	48	78
116. Carbon tetrachloride	103	10	10	20	4	107	6	6
117. Bromodichloromethane	78	16	21	20	4	79	16	20
118. 1,2-Dichloropropane	78	29	37	20	2	92	8	8
119. Trans-1,3-dichloropropylene	80	5	6	20	3	75	3	4
120. Trichloroethylene	108	24	22	20	7	63	49	78
121. Benzene	92	18	19	20	4	81	14	17
122. Cis-1,3-dichloropropylene	83	6	7	20	1	76	4	5
123. Dibromochloromethane	102	24	23	20	5	108	26	24
124. 1,1,2-Trichloroethane	95	15	16	20	3	94	12	13
125. Bromoform	58	20	35	20	7	60	22	37
126. 1,1,2,2-Tetrachloroethane	77	10	14	20	1	81	9	11
127. 1,1,2,2-Tetrachloroethylene	95	9	9	20	13	67	53	79
128. Toluene	75	10	13	20	9	72	22	31
129. Chlorobenzene	85	17	20	20	5	87	20	23
130. Ethyl benzene	70	13	19	20	41	70	33	47

[a] Calculated from 3 data points

[b] Calculated from 6 data points

• Four of the compounds that were not detected during the Cincinnati and St. Louis studies (chloromethane, bromomethane, vinyl chloride and chloroethane) were detected during the Atlanta study. However, recovery and precision data were high, ranging from 161% ± 40 to 330% ± 126. The cause of this problem has not yet been determined. Method blanks did not indicate any contamination.

Dichlorodifluoromethane was not detected and was apparently breaking through the trap, in spite of the added charcoal. Acrolein data were also poor. Since there was no response for acrolein when the standard was injected directly onto the GC column, it can be presumed that the acrolein standard had degraded.

The QC data for methylene chloride improved substantially during the Atlanta study. It is believed that the sporadic contamination problem present in the Cincinnati and St. Louis studies was not as serious in the Atlanta study.

When the new trap (with charcoal added) was being evaluated, true recoveries for the volatile priority pollutants were determined. The EPA Screening Protocol[1] recommends that volatile priority pollutant concentrations be calculated by using calibration standards that have been purged and trapped. In order to evaluate the new trap, recovery data were approximated by using calibration standards directly injected onto the GC column.

The poorest recoveries, less than 20%, occurred with the most volatile compounds - chloromethane, dichlorodifluoromethane, and bromomethane. Otherwise, the average recovery obtained for the volatile priority pollutants and the internal standards was 60% (range 40% to 100%).

ACIDS

The relative retention times and calibration data for the acid priority pollutants are given in Table B-3. Table B-4 presents the acid QC data from the Atlanta study. In general, these data are comparable to the data obtained previously. The precision improved substantially (factor of three) for the following five acid priority pollutants: 2-chlorophenol, 2-nitrophenol, 2,4-dimethylphenol, 2,4-dichlorophenol, and 2,4,6-trichlorophenol.

Table B-3

CALIBRATION VALUES FOR CONCENTRATION CALCULATIONS

Acids

COMPOUND		RRTs[a]	slope[b]	int.[b]	Rep. Limit	
					area	µg/L
201.	2–Chlorophenol	0.340	13.6852	7.4329	.1871	10
202.	2–Nitrophenol	0.388	30.2558	5.8283	.1380	10
203.	Phenol	0.470	14.0186	2.3864	.5480	10
204.	2,4–Dimethylphenol	0.555	18.0665	6.4790	.1949	10
205.	2,4–Dichlorophenol	0.577	17.9196	4.9780	.2800	10
206.	2,4,6–Trichlorophenol	0.720	23.5207	5.6063	.1870	10
207.	4–Chloro–3–cresol	0.815	19.9290	0.7696	.4630	10
208.	2,4–Dinitrophenol	0.000	73.4759	19.4594	.0750	25
209.	4,6–Dinitro–2–cresol	1.054	46.9461	13.7729	.2390	25
210.	Pentachlorophenol	1.205	51.9267	3.7533	.1203	10
211.	4–Nitrophenol	2.024	41.8218	11.6772	.0795	15

[a] Relative Retention Times - relative to D_{10}-anthracene

[b] x = GC/MS response
y = concentration

Table B-4

SUMMARY OF QUALITY CONTROL DATA

Acids

COMPOUND	Method Ref. Std.[a]			Raw Wastewater Spike[b]				
	$\bar{X}$	Sp	%Sp	C	Rc	$\bar{X}$	Sp	%Sp
201. 2-Chlorophenol	80	11	14	50	11	69	4	6
202. 2-Nitrophenol	79	16	20	50	16	70	5	8
203. Phenol	65	10	15	50	12	46	9	20
204. 2,4-Dimethylphenol	83	10	12	50	13	74	4	5
205. 2,4-Dichlorophenol	91	13	15	50	11	88	8	9
206. 2,4,6-Trichlorophenol	72	12	17	50	16	72	5	7
207. 4-Chloro-3-cresol	87	12	14	50	17	81	10	13
208. 2,4-Dinitrophenol	-	-	-	50	-	20	31	155
209. 4,6-Dinitro-2-cresol	-	-	-	50	-	33	37	112
210. Pentachlorophenol	43	6	14	50	16	123	14	11
211. 4-Nitrophenol	52	5	10	50	12	70	8	11

[a] Calculated from 3 data points.

[b] Calculated from 6 data points.

2,4-Dinitrophenol and 4,6-dinitro-2-cresol chromatographed very poorly on the GC column (1% SP 1240DA) during both the Atlanta and St. Louis studies. Consequently, the QC data for these two compounds were poor. As before, the QC data for the raw wastewater spikes were better than those for the method reference standards. One explanation for this phenomenon could be that the more acidic sample matrix deactivates the 1% SP1240DA GC packing in a manner similar to phosphoric acid.

BASE/NEUTRALS

During the Atlanta study, two gas chromatography columns - 3% SP 2250DB and 1% SP2250 - were employed in the GC/MS analysis of the base/neutral priority pollutants. Poor chromatographic results were obtained with the 3% SP2250DB column used initially, and new columns with the same packing did not substantially improve the chromatography. Therefore, columns packed with 1% SP2250 were employed for the remainder of the analyses.

Relative retention times and calibration data for the base/neutral priority pollutants chromatographed with the 3% SP2250DB and 1% SP2250 GC packings are given in Tables B-5 and B-6, respectively. The set of calibration values used to calculate concentration levels in the samples was determined by the GC column on which the particular sample was analyzed.

Table B-7 presents the base/neutral quality control data from the Atlanta study. The recoveries were somewhat lower than those determined for the Cincinnati and St. Louis studies, whereas the precision improved. The lower recoveries may be attributed in part to the more complex sample matrix found in the Atlanta samples.

Table B-5

CALIBRATION VALUES FOR CONCENTRATION CALCULATIONS

Base/Neutrals - 3% SP 2250DB

	COMPOUND	RRTs[a]	Slope[b]	Intercept[b]	Reporting Limit	
					Area	µg/L
301.	1,3 Dichlorobenzene	.320	.1132	.6135	.5188	10
302.	1,4 Dichlorobenzene					
303.	1,2 Dichlorobenzene					
304.	Hexachloroethane	.351	.0539	.0488	.5879	10
305.	Bis(chloromethyl)ether	-	-	-	-	-
306.	Bis(2-chloroethyl) ether	.364	.0849	.1082	.7406	10
307.	Bis(2-chloroisopropyl) ether	.000	.1495	1.4817	2.9767	10
308.	N-Nitrosodimethylamine	.503	.0381	.9997	.1430	30
309.	Nitrosodi-n-propylamine	.516	.0152	.1137	.0387	10
310.	Nitrobenzene	.485	.0542	.6739	.1384	15
311.	Hexachlorobutadiene	.492	.0768	.6325	.1354	10
312.	1,2,4-Trichlorobenzene	.502	.1183	.8897	.2933	10
313.	2-Chloroethyl vinyl ether	-	-	-	-	-
314.	Bis(2-chloroethoxy) methane	.529	.0792	.0019	.7897	10
315.	Naphthalene	.527	.2343	.8346	1.5088	10
316.	Isophorone	.612	.0945	.4100	1.3545	10
317.	Hexachlorocyclopentadiene	-	-	-	-	-
318.	2-Chloronaphthalene	.689	.1469	.3718	1.8406	10
319.	Acenaphthylene	.756	.1759	.1975	1.9561	10
320.	Acenaphthene	.775	.1440	.0021	1.4378	10
321.	Dimethyl phthalate	.798	.1957	.1730	2.1295	10
322.	2,6-Dinitrotoluene	.815	.0340	.0544	.2855	10
323.	4-Chlorophenyl phenyl ether	.844	.1308	.3849	1.6930	10
324.	Fluorene	.848	.1733	.1233	1.8561	10
325.	2,4-Dinitrotoluene	.868	.0372	.1132	.2591	10
326.	Diethyl phthalate	.877	.1912	1.5725	3.4346	10
327.	1,2-Diphenylhydrazine	.872	.2400	.0744	2.4740	10
328.	N-Nitrosodiphenylamine	.905	.0884	.2105	.6738	10
329.	Hexachlorobenzene	.914	.0499	.1076	.6061	10
330.	4-Bromophenyl phenyl ether	.918	.0461	.0771	.5381	10

Table B-5 (Cont'd)

CALIBRATION VALUES FOR CONCENTRATION CALCULATIONS

Base/Neutral - 3% SP 2250DB

COMPOUND	RRTs[a]	Slope[b]	Intercept[b]	Reporting Limit	
				Area	µg/L
331. Anthracene	1.000	.2045	.9444	2.9898	10
332. Phenanthrene					
333. Di-n-butyl phthalate	1.083	.2979	2.558	5.537	10
334. Fluoranthene	1.177	.2195	.0538	1.0435	5
335. Pyrene	1.214	.2670	.1478	1.4827	5
336. Benzidine	1.293	.0189	.0279	.1609	10
337. Butyl benzyl phthalate	1.323	.1158	.1680	1.3265	10
338. Bis(2-ethylhexyl) phthalate	1.355	.1341	1.1847	2.5254	10
339. Di-n-octyl phthalate					
340. Chrysene	1.404	.2187	1.3421	.8445	10
341. Benzo(a)anthracene					
342. 3,3'-Dichlorobenzidine	1.453	.0633	.5560	.0774	10
343. Benzo(b)fluoranthene	1.595	.1824	.1130	.7990	5
344. Benzo(k)fluoranthene					
345. Benzo(a)pyrene	1.693	.1617	.3110	1.1196	5
346. Indeno (1,2,3-c,d) pyrene	2.184	.1738	.3143	1.1831	5
347. Dibenzo (a,h) Anthracene	2.200	.1604	.7805	.0213	5
348. Benzo (g,h,i) perylene	2.367	.1774	.4209	1.3078	5
2-Fluoronaphthalene	.520				
Octafluorobiphenyl	.502				
Decafluorobiphenyl	.389				
9-Phenylanthracene	1.368				

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[a] Retention time, relative to D_{10}-anthracene (21.55 minutes).

[b] x = concentration

y = GC/MS response

Table B-6

CALIBRATION VALUES FOR CONCENTRATION CALCULATIONS

Base/Neutrals - 1% SP 2250

COMPOUND	RRTs[a]	Slope[b]	Intercept[b]	Reporting Limit	
				Area	µg/L
301. 1,3 Dichlorobenzene	0.354	.0715	5.0197	5.7343	10
302. 1,4 Dichlorobenzene					
303. 1,2 Dichlorobenzene					
304. Hexachloroethane	0.359	.0327	.4987	.8259	10
305. Bis(chloromethyl)ether					
306. Bis(2-chloroethyl) ether	0.408	.0780	.9289	1.7089	10
307. Bis(2-chloroisopropyl) ether					
308. N-Nitrosodimethylamine	0.490	.0026	.0228	.0032	10
309. Nitrosodi-n-propylamine	0.502	.0175	.1155	.2902	10
310. Nitrobenzene	0.504	.0370	.1668	.5364	10
311. Hexachlorobutadiene	0.502	.0323	.9503	1.2729	10
312. 1,2,4-Trichlorobenzene	0.520	.0637	1.3866	2.0236	10
313. 2-Chloroethyl vinyl ether					
314. Bis(2-chloroethoxy) methane	0.547	.0924	.8540	1.7777	10
315. Naphthalene	0.542	.2219	3.0661	5.2850	10
316. Isophorone	0.577	.0901	2.0048	2.9055	10
317. Hexachlorocyclopentadiene					
318. 2-Chloronaphthalene	0.701	.1253	2.0201	3.2731	10
319. Acenaphthylene	0.766	.1852	1.6749	3.5271	10
320. Acenaphthene	0.780	.1326	1.2468	2.5723	10
321. Dimethyl phthalate	0.799	.1373	2.1842	3.5567	10
322. 2,6-Dinitrotoluene	0.819	.0307	.2555	.5623	10
323. 4-Chlorophenyl phenyl ether	0.847	.2377	2.8939	5.2711	10
324. Fluorene	0.853	.1281	2.1051	3.3865	10
325. 2,4-Dinitrotoluene	0.870	.0448	.4097	.8582	10
326. Diethyl phthalate	0.874	.1511	2.4250	3.9358	10
327. 1,2-Diphenylhydrazine	0.876	.2211	2.2982	4.5088	10
328. N-Nitrosodiphenylamine	0.900	.0805	.4574	1.2619	10
329. Hexachlorobenzene	0.916	.0463	.8358	1.2984	10
330. 4-Bromophenyl phenyl ether	0.918	.0551	.5328	1.0838	10

Table B-6(cont.)

CALIBRATION VALUES FOR CONCENTRATION CALCULATIONS

Base/Neutrals - 1% SP 2250

COMPOUND		RRTs[a]	Slope[b]	Intercept[b]	Reporting Limit	
					Area	µg/L
331.	Anthracene	1.001	.2283	2.5189	4.8017	10
332.	Phenanthrene					
333.	Di-n-butyl phthalate	1.073	.3254	4.7456	7.9993	10
334.	Fluoranthene	1.170	.2056	.9806	2.0088	5
335.	Pyrene	1.206	.2478	1.2936	2.5328	5
336.	Benzidine	1.264	.0002	.4356	.4376	10
337.	Butyl benzyl phthalate	1.303	.1021	2.5142	3.5349	10
338.	Bis(2-ethylhexyl) phthalate	1.333	.1787	5.1072	6.8942	10
339.	Di-n-octyl phthalate					
340.	Chrysene	1.387	.1477	1.6034	2.3417	5
341.	Benzo(a)anthracene					
342.	3,3'-Dichlorobenzidine	1.420	.0309	.1151	.4241	10
343.	Benzo(b)fluoranthene	1.608	.1944	.1437	1.1157	5
344.	Benzo(k)fluoranthene					
345.	Benzo(a)pyrene	0.000	.1904	.1947	1.1468	5
346.	Indeno (1,2,3-c,d) pyrene	2.304	.1719	.2588	1.1181	5
347.	Dibenzo (a,h) Anthracene	2.315	.1350	.2205	.8955	5
348.	Benzo (g,h,i) perylene	2.528	.1493	.4467	1.1933	5
349.	2-Fluononaphthalene IS	.537				
350.	Octafluorobiphenyl IS	.512				
351.	Decafluorobiphenyl, IS	.401				
352.	9-Phenylanthracene, IS	1.351				

[a] Retention time, relative to D_{10}-anthracene (22.54 minutes).

[b] x=concentration, y=GC/MS response.

Table B-7

SUMMARY OF QUALITY CONTROL DATA
BASE/NEUTRALS

COMPOUND	Method Reference[a]			Raw Wastewater Spike[b]				
	$\overline{P}$	Sp	%Sp	C	Rc	$\overline{P}$	Sp	%Sp
301. 1,3 Dichlorobenzene	50	28	55	150	138	70	21	30
302. 1,4 Dichlorobenzene								
303. 1,2 Dichlorobenzene								
304. Hexachloroethane	61	21	34	50	28	74	31	42
305. Bis(chloromethyl)ether	–	–	–	50	–	–	–	–
306. Bis(2–chloroethyl) ether	48	19	40	50	26	83	26	32
307. Bis(2–chloroisopropyl) ether				c				
308. N–Nitrosodimethylamine	–	–	–	50	–	–	–	–
309. Nitrosodi-n-propylamine	64	15	23	51	19	74	20	27
310. Nitrobenzene	52	10	19	50	18	66	8	12
311. Hexachlorobutadiene	31	30	96	51	22	35	6	18
312. 1,2,4–Trichlorobenzene	49	17	35	50	24	58	12	20
313. 2–Chloroethyl vinyl ether	–	–	–	50	–	–	–	–
314. Bis(2–chloroethoxy) methane	53	20	37	50	26	80	21	26
315. Naphthalene	65	22	33	50	48	69	30	43
316. Isophorone	47	16	33	50	40[d]	62[d]	22[d]	35[d]
317. Hexachlorocyclopentadiene	–	–	–	50	–	–	–	–
318. 2–Chloronaphthalene	61	24	39	50	31	66	18	27
319. Acenaphthylene	63	16	25	50	21	73	13	17
320. Acenaphthene	72	25	34	50	22	74	17	23
321. Dimethyl phthalate	54[e]			50	22	48	7	14
322. 2,6–Dinitrotoluene	65	19	29	50	21	61	12	20
323. 4–Chlorophenyl phenyl ether	106	56	53	50	19	87	25	28
324. Fluorene	66	19	29	50	14	68	11	16
325. 2,4–Dinitrotoluene	57	16	29	53	12[d]	52[d]	10[d]	19[d]
326. Diethyl phthalate	42	27	63	50	16	77	26	34
327. 1,2–Diphenylhydrazine	64	21	33	50	15	71	16	23
328. N–Nitrosodiphenylamine	77	22	29	50	15	95	15	16

Table B-7 (cont'd.)

SUMMARY OF QUALITY CONTROL DATA
BASE/NEUTRALS

COMPOUND		Method Reference[a]			Raw Wastewater Spike[b]				
		$\overline{P}$	Sp	%Sp	C	Rc	$\overline{P}$	Sp	%Sp
329.	Hexachlorobenzene	57	29	51	50	34	44	10	23
330.	4–Bromophenyl phenyl ether	74	24	32	51	19	58	7	12
331.	Anthracene	83	26	32	100	39	76	11	14
332.	Phenanthrene								
333.	Di-n-butyl phthalate	59	14	24	50	34	74	22	29
334.	Fluoranthene	72	22	31	25	9	59	6	11
335.	Pyrene	72	21	29	25	15	56	8	14
336.	Benzidine	–	–	–	150	–	–	–	–
337.	Butyl benzyl phthalate	33	34	104	50	104	38	22	57
338.	Bis(2–ethylhexyl) phthalate	35	33	92	100	108	35	10	29
339.	Di-n-octyl phthalate								
340.	Chrysene	59	20	34	50	30	47	6	13
341.	Benzo(a)anthracene								
342.	3,3'–Dichlorobenzidine	65	13	20	50	22	70	10	15
343.	Benzo(b)fluoranthene	53	30	56	29	15	41	7	17
344.	Benzo(k)fluoranthene								
345.	Benzo(a)pyrene	49	30	61	25	19	38	9	24
346.	Indeno (1,2,3–c,d) pyrene				c				
347.	Dibenzo (a,h) Anthracene	37	36	97	25	39	28	14	50
348.	Benzo (g,h,i) perylene	9	16	173	50	–	4	10	245

[a] Based on three data points

[b] Based on six data points

[c] Standard not available for spiking solution

[d] Based on four data points

[e] Based on one data point

The base/neutral priority pollutants that were still not detected in Atlanta are listed below along with their respective problems.

Bis(chloromethyl)ether - very short half-life in water.
N-nitrosodimethylamine - low recovery, high GC/MS reporting limit.
2-Chloroethylvinylether - volatile (b.p. 109°C), causing erratic recoveries during Kuderna Danish concentration.
Hexachlorocyclopentadiene - high GC/MS reporting limit.
Benzidine - high GC/MS reporting limit, heat labile, unstable in methylene chloride.

In addition to these compounds, benzo(g,h,i)perylene gave poor GC data. The source of problems with this compound is not yet known.

PESTICIDES AND PCBs

The method for analyzing priority pollutants in the pesticide and PCB category was again modified for the Atlanta study. In addition to the second GC column added in the St. Louis study,[5] a third GC column was used to further corroborate the identification of the pesticides and PCBs on the other two GC columns, thereby decreasing the number of samples that required further analysis by GC/MS.

The third GC column was packed with a dimethylsilicone/trifluoropropyl silicone (Supelco's 6% SE30/4% QF-1) GC packing in a 180 cm x 4 mm I.D. glass column. The GC column temperature was maintained at 225°C (isothermal), the injector temperature was 300°C, and the 95% Argon/5% methane flow rate was 75 mL/minute. The retention times of the pesticides on the 6% SE30/4% QF-1 GC column were substantially longer than the retention times on the other two GC columns and are tabulated in Table B-8. Any pesticides and PCBs identified on the three GC columns were confirmed using GC/MS techniques.

Typical calibration values used to calculate pesticide and PCB concentration levels are given in Table B-9. Table B-10 presents the pesticide and PCB quality control data from the Atlanta study. Overall, the Atlanta quality control data were comparable to the data from Cincinnati and St. Louis with some improvement in the precision. The priority pollutant pesticides and PCBs that are not listed in this table were not available to spike into the QC samples.

Table B-8

RELATIVE RETENTION TIMES

	4mm[a] 1.5% SP 2250 1.95% SP 2401	4mm[b] 4% SE-30 6% QF-1	2mm[c] 1.5% SP 2250 1.95% SP 2401
alpha-BHC	.478	.525	0.402
gamma-BHC	.593	.645	0.525
beta-BHC	.675	.681	0.630
Heptachlor	.714	.885	0.664
delta-BHC	.778	.738	0.741
Aldrin	.853	1.074	0.819
Heptachlor Epoxide	1.264	1.542	1.308
Endosulfan I	1.575	1.943	1.665
DDE	1.803	1.805	2.081
Dieldrin	1.932	2.310	2.248
Endrin	2.253	2.632	2.601
DDD	2.850	2.779	3.137
Endosulfan II	2.850	2.788	3.137
DDT	2.850	2.991	3.338
Endrin Aldehyde	3.771	3.634	3.660
Endosulfan Sulfate	4.661	4.757	4.442

PCB 1254 -	Peak 1	1.489
	Peak 2	2.2590
	Peak 3	2.5324
	Peak 4	3.2626
	Peak 5	4.125

a,b,c - Relative to internal standard tetrachlorotetrahydronaphthalene

[a] Retention Time = 3.00 minutes

[b] Retention Time = 8.6 minutes

[c] Retention Time = 6.30 minutes

Table B-9

CALIBRATION VALUES FOR CONCENTRATION CALCULATIONS

PESTICIDES

Compound	Slope	Intercept	Reporting Limit (μg/L)
401. alpha-BHC	10.3434	.0551	1
402. gamma-BHC	8.7253	-.1193	1
403. beta-BHC	9.6276	-.2423	1
404. Heptachlor	3.2679	-.0161	1
405. delta-BHC	6.7294	-.1753	1
406. Aldrin	6.8552	-.1611	1
407. Heptachlor epoxide	7.9061	-.1854	1
408. Endosulfan I.	6.0321	-.1607	1
409. DDE	9.7662	-.2644	1
410. Dieldrin	13.6615	-.3600	1
411. Endrin	3.6592	-.0793	1
412. DDD	6.8075	-.1678	1
413. Endosulfan II			1
414. DDT	3.1368	-.0512	1
415. Endrin aldehyde	6.8588	.0266	1
416. Endosulfan sulfate	4.2673	-.0763	1
423. PCB-1254	.6417	-.0464	1

Table B-10

QUALITY CONTROL DATA
PESTICIDES

Compound	Method Reference Standard (a)				Raw Wastewater (b)			
	$\bar{P}$	Sp	%SP	C	Rc	$\bar{P}$	Sp	%Sp
401. alpha-BHC	73	32	44	10	3	63	18	28
402. gamma-BHC	73	32	44	10	5	68	29	43
403. beta-BHC	70	10	14	10	2	72	12	16
404. Heptachlor	70	10	14	10	2	72	12	16
405. delta-BHC	80	10	12	10	2	87	20	23
406. Aldrin	70	10	14	10	3	75	15	20
407. Heptachlor epoxide	87	12	13	10	1	88	10	11
408. Endosulfan I.	50	10	20	10	5	47	8	18
409. DDE	83	6	7	10	4	85	14	16
410. Dieldrin	40	10	25	10	3	35	8	24
411. Endrin	83	15	18	10	0	87	19	22
412. DDD	83	21	25	10	4	92	22	24
414. DDT	73	25	34	10	3	67	10	16

(a) Calculated from 3 data points.

(b) Calculated from 6 data points.

TOTAL CYANIDES and TOTAL PHENOLS

The Atlanta QC data for total cyanides and total phenols are given in Table B-11. The data are comparable to the QC data obtained in the Cincinnati and St. Louis studies, and are good.

The meaning of the total phenol values was discussed in the Cincinnati report.[4] During the Cincinnati study, it was observed that the only phenol found in the GC/MS analysis was phenol itself and there was no strong correlation between the total phenols and phenol values. It was suggested that the apparent total phenol value was partially due to some interfering species present only in the raw wastewater. Prior to collecting samples in Atlanta, a few experiments were run to gain some insight into the total phenol values. It was determined that non-priority pollutant phenols, such as resorcinol (a dihydroxybenzene), will react with 4-aminoantipyrine (4-AAP) and subsequently produce a positive color response. Compounds which could potentially react with 4-AAP, e.g., aniline and vanillin, did not react at concentration levels of 100 µg/L. Therefore, it is suggested that the total phenol values are due to phenols other than those on the priority pollutant list.

Other non-priority pollutant compounds that Emerson (1943) has reported* to react with 4-AAP include o-cresol, m-cresol, 2,5 dimethyl phenol, methyl salicylate, and salicylic acid: compounds that were identified in the Atlanta POTW influent, as discussed in Section V.

Some of the acid priority pollutants (2-nitrophenol, 2,4-dimethylphenol, 4-nitrophenol, 2,4-dinitrophenol and 4,6-dinitro-2-cresol) would not be expected to react with 4-AAP based on the following of Emerson's observations:

- "Substituents in position para to the hydroxyl group prevent the reaction except as follows: halogen, carboxyl, sulfonic acid, hydroxyl, and methoxyl. These groups are probably expelled.
- A nitro group in the ortho position prevents reaction and a nitro group inhibits the test but not completely."

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*Emerson, E. (1943) J. Org. Chem. 8, 226.

Table B-11

QUALITY CONTROL DATA
TOTAL CYANIDES/TOTAL PHENOLS

	Method Ref. Std.[a]			Raw Wastewater Spikes[b]				
	$\bar{P}$	SP	%Sp	C	RC	P	Sp	% Sp
Total Cyanides	87	11.5	13.3	20	17.4	77	13.3	17.3
Total Phenols	101.6	2.9	2.8	60	6	97	6	6

[a] based on 3 data points

[b] based on 6 data points

METALS

The methods used for instrumental analysis, as well as the reporting limits for the metallic priority pollutants, are given in Table B-12.

Antimony could not be analyzed in nine of the samples from industrial sources. Specifically, samples selected for analysis by the method of standard additions did not show increases in apparent concentration corresponding to the amounts of antimony standard solution added. Similarly, spiked raw wastewater samples among the nine samples were found to have an apparent concentration close to or equal to the corresponding unspiked raw wastewater samples. All sample preparation and analysis procedures used for these nine samples were identical to those used for all other samples, which were analyzed with no apparent difficulty. This, along with the fact that all nine samples were from a single source type (industrial), suggests that matrix interferences unique to these nine samples were responsible for the observed difficulties. The diagnostic capability of the instrumentation used for these analyses was not adequate to permit further identification of the exact source of these problems within the allowed time.

The metals QC data are given in Table B-13. Overall, the data are good, with recoveries in the range of 75% to 100%. The poor precision in the analysis of lead can be attributed to high concentration levels of lead in the raw wastewater samples. The 100 µg/L spike was added to samples that already contained as much as 680 µg/L of lead.

CLASSICAL PARAMETERS

QC data were obtained for the classical parameters--ammonia, oil and grease, total organic carbon (TOC), chemical oxygen demand (COD), biochemical oxygen demand (BOD) and total suspended solids (TSS).

Table B-12

ANALYTICAL METHODS AND REPORTING LIMITS
Metals

		μg/L
501. Antimony	FAAS	1
502. Arsenic	AA Hydride evolution	4
503. Beryllium	FAAS	1
504. Cadmium	FAAS	3
505. Chromium	PES	1
506. Copper	PES	3
507. Lead	PES	10
508. Manganese	PES	3
509. Mercury	FAAS Cold vapor	1
510. Nickel	PES	1
511. Selenium	AA Hydride evolution	3
512. Silver	PES	3
513. Thallium	FAAS	1
514. Zinc	PES	10

FAAS - Flameless Atomic Adsorption Spectroscopy - Graphite Furnace

PES - Plasma Emission Spectroscopy

AA - Atomic Adsorption

Table B-13

QUALITY CONTROL DATA
METALS

SAMPLE NUMBER	Method Reference Standard (a)			Raw Wastewater (b)				
Metal	$\bar{F}$	Sp	%Sp	C	Rc	$\bar{F}$	Sp	%Sp
501. Antimony	120(c)	33	28	10	12	73	19	25
502. Arsenic	113	18	16	25	6	95	11	11
503. Berylium	110	10	9	10	1	102	10	10
504. Cadmium	70	26	38	10	4	72	45	63
505. Chromium	97(c)	3	3	100	0	97	2	2
506. Copper	85	6	7	50	16	107	10	9
507. Lead	97	1	1	50	129	75	35	47
508. Manganese	99	1	1	100	0	103	5	5
509. Mercury	83	6	7	10	1	75	5	7
510. Nickel	100	4	4	50	8	100	3	3
511. Selenium	152(c)	13	8	10	6	72	34	47
512. Silver	122(c)	10	8	10	7	117	35	30
513. Thallium	87	21	24	10	1	82	10	12
514. Zinc	98	2	2	100	26	83	18	21

(a) Based on 3 data points.

(b) Based on 6 data points.

(c) Based on 4 data points.

Four method reference standards were prepared by adding the classical parameter standards (purchased from Environmental Research Associates) to clean water to obtain known concentration levels. There was a shipping delay of at least one week before the samples were analyzed.

The QC data are given below:

		C(a)	$\bar{P}$(b)		Sp(c)
703.	Ammonia	4.1	94	±	2
704.	Oil and Grease	230	79	±	24
705.	TSS	70	42	±	33
706.	TOC	75	102	±	2
707.	COD	190	75	±	12
708.	BOD	105	117	±	8

(a) C = concentration level (mg/L) to which the classical parameters were spiked.

(b) $\bar{P}$ = average recovery based on four data points.

(c) Sp = standard deviation.

The average recoveries obtained for all the classical parameters, except total suspended solids (TSS), ranged from 75% to 100% of the true value. The average recovery for TSS was low (42%) while the precision was high (±33). The cause for this has not yet been determined.

APPENDIX C

ACID AND BASE/NEUTRAL INTERNAL STANDARDS

When analyzing for acid and base/neutral priority pollutants using gas chromatography/mass spectroscopy (GC/MS) techniques, the use of an internal standard is required in order to minimize the inherent variability in the mass spectrometer system. The internal standard specified in the EPA Screening Protocol[1] is d_{10}-anthracene.

During the Cincinnati[4] and St. Louis[5] studies, d_{10}-anthracene was added to the raw wastewater sample aliquots for acid and base/neutral analysis, prior to sample preparation, to give a concentration level of 5 µg/L sample. The recovery of d_{10}-anthracene for the overall method (extraction, concentration and GC/MS analysis) was found to be 90.4% for the Acid method and 93.0% for the Base/Neutral method, as given in the St. Louis report.

During the Atlanta study, d_{10}-anthracene was added to the final, concentrated methylene chloride extract to give a concentration level of 5 µg/2 mL (equivalent to 5 µg added to 1 L aqueous sample aliquot, according to the EPA protocol). By adding d_{10}-anthracene to the extract rather than to the aqueous sample aliquot, any effects of extracting and concentrating d_{10}-anthracene from the aqueous samples were eliminated. The d_{10}-anthracene peak areas from sample extracts were compared to the d_{10}-anthracene areas from calibration standards. These d_{10}-anthracene values (expressed as a percentage of the calibration standards) were 101% for the Acid samples and 106% for the Base/Neutrals. This change in procedure does not allow compensation for the effects of sample preparation on recovery as the analysis of the previous sample did.

Since d_{10}-anthracene was no longer being added to the sample aliquots prior to extraction for acid and base/neutral analyses as was done for the Cincinnati and St. Louis surveys, it was decided to add four other compounds to the aqueous aliquots in order to monitor the total method, i.e., extraction, concentration and GC/MS analysis, and provide a basis for comparison with the d_{10}-anthracene values. These four total method internal standards were added to all the Acid and Base/Neutral aqueous samples. In this way, a measure of the quality of the data for all samples was obtained.

The four compounds chosen to act as total method internal standards were 2-fluoronaphthalene, octafluorobiphenyl, decafluorobiphenyl and 9-phenylanthracene. These were chosen because they do not normally occur in the environment, and they do not interfere with the priority pollutant analysis by GC/MS. The four compounds were added into the Acid and Base/Neutral aqueous samples to give a concentration level of 5 µg/L each.

For the acid analysis, only three of the four total method internal standards were analyzed. The fourth internal standard, 9-phenylanthracene, did not elute from the Acid GC column (Supelco's 1% SP1240 DA) within a reasonable period of time. Areas for the internal standard peaks were not obtained for all the acid samples. The percentage recoveries for the three total method internal standards (relative to d_{10}-anthracene) were:

2-Fluoronaphthalene	- 84% ± 42	n = 28
Octafluorobiphenyl	- 92% ± 38	n = 12
Decafluorobiphenyl	- 78% ± 36	

The percentage recoveries for these internal standards in the Base/Neutral analysis (relative to d_{10}-anthracene) were:

2-Fluoronaphthalene	- 122% ± 61	n = 32
Octafluorobiphenyl	- 80% ± 22	
Decafluorobiphenyl	- 78% ± 21	
9-Phenylanthracene	- 88% ± 35	

These data indicate that the total method, as used in Atlanta, was in control. Further, the data confirm the validity of the Cincinnati and St. Louis results and deomonstrate that equivalent data are obtained with either internal standard method.

APPENDIX D

ANALYTICAL DATA BY SITE

This appendix contains the results of the chemical analyses for all the samples obtained in Atlanta. The data have been organized by site. Each sample represents a 48-hour collection period; the increments were flow composited to produce the final sample. In addition, the average presented for each chemical is a flow-weighted average of the individual samples collected at each location.

The data for the organics, metals, total cyanides, and total phenols (100-300, 500, and 600 series) are given in µg/L; the data on the classical parameters (700 series) are presented in mg/L. Only those compounds detected at least once in the Atlanta samples have been included in these tables.

Atlanta Samples

Sampling Site	Analytical Code	4/3 Tues 4/4 Wed	4/5 Thurs 4/6 Fri	4/7 Sat 4/8 Sun	Comments
POTW Influent	INF	201	212-QC	222	
Tap Water	TAP	202		223	
Northside	NSC	203	213	224	Residential
Lenox	LS	204	214	225	Commercial
Sixteenth	GAT	205	215	226	Commercial-Downtown
Peachtree	BJG	206-QC	216	227	Downtown
DeFoors	DFR	207	217-QC	228	Industrial
DeKalb	NDD	208	218	229	Commercial
Surrey	SC/PL	209-QC	219	230	Industrial
Ensign	{ SWX { END	210	220	231	Industrial
Warren	WHL	211	221	232-QC	Residential
Field Blank (Teams 1&3)	FB			233	
Field Blank (Teams 2&4)	FB			234	
Total Lab Samples		19	18	17 = 54	
QC-Contingency Samples		4	4		
Lab Samples Less Contingency Samples		15	14	17 = 46	

NORTHSIDE

SAMPLE NUMBER	203		213		224		Avg.	
Organics (µg/L)								
104. Vinyl chloride	–		–		–		–	
105. Chloroethane	–		–		–		–	
108. Trichlorofluoromethane	–		–		–		–	
109. Acrylonitrile	–		–		–		–	
110. 1,1-Dichloroethylene	–		–		–		–	
111. 1,1-Dichloroethane	–		–		–		–	
112. Trans-1,2-dichloroethylene	–		–		–		–	
113. Chloroform	3		4		4		3.7	
114. 1,2-Dichloroethane	–		–		–		–	
115. 1,1,1-Trichloroethane	3		1		–		1.3	
116. Carbon tetrachloride	–		–		–		–	
117. Bromodichloromethane	–		–		–		–	
118. 1,2-Dichloropropane	–		–		–		–	
120. Trichloroethylene	–		3		3		2.1	
121. Benzene	–		–		–		–	
123. Dibromochloromethane	–		–		–		–	
124. 1,1,2-Trichloroethane	–		–		–		–	
126. 1,1,2,2-Tetrachloroethane	–		–		–		–	
127. 1,1,2,2-Tetrachloroethylene	10		9		7		8.6	
128. Toluene	1		2		1		1.3	
129. Chlorobenzene	–		–		–		–	
130. Ethyl benzene	–		–		–		–	
201. 2-Chlorophenol	–		–		–		–	
203. Phenol	–		–		–		–	
204. 2,4-Dimethylphenol	–		–		–		–	
205. 2,4-Dichlorophenol	–		–		–		–	
206. 2,4,6-Trichlorophenol	–		–		–		–	
210. Pentachlorophenol	18		12		–		9.7	
301. Dichlorobenzenes	–		–		–		–	
315. Naphthalene	–		–		–		–	
326. Diethyl phthalate	–		–		–		–	
331. Anthracene/Phenanthrene	–		–		–		–	
333. Di-n-butyl phthalate	–		–		–		–	
337. Butyl benzyl phthalate	–		–		–		–	
338. Bis (2-ethylhexyl) phthalate	–		–		–		–	

NORTHSIDE

SAMPLE NUMBER	203		213		224		Avg.	

Metals (µg/L)

501. Antimony	–		–		–		–	
502. Arsenic	–		–		–		–	
504. Cadmium	–		–		–		–	
505. Chromium	49		16		10		24.2	
506. Copper	28		52		35		38.6	
507. Lead	35		63		27		41.7	
508. Manganese	160		200		180		180.5	
509. Mercury	–		–		–		–	
510. Nickel	4		2		3		3.0	
511. Selenium	–		–		–		–	
512. Silver	10		7		–		5.5	
514. Zinc	120		150		130		133.6	

601. Total Cyanides	24		–		–		7.5	

602. Total Phenols	17		22		22		20.4	

Classical Parameters (mg/L)

701. pH	6.6		6.6		6.6			
702. T (°C)	16.8		16.8		16.3			
703. Ammonia	7.5		9.2		10.5		9.1	
704. Oil and Grease	20		35		32		29.3	
705. TSS	60		100		70		77.0	
706. TOC	33		73		69		59.1	
707. COD	80		180		180		361.8	
708. BOD	50		80		95		75.8	

WARREN

SAMPLE NUMBER		211		221		232		Avg.	
Organics (µg/L)									
104.	Vinyl chloride	-		-		-		-	
105.	Chloroethane	-		-		-		-	
108.	Trichlorofluoromethane	-		-		-		-	
109.	Acrylonitrile	-		-		-		-	
110.	1,1-Dichloroethylene	-		-		-		-	
111.	1,1-Dichloroethane	-		-		-		-	
112.	Trans-1,2-dichloroethylene	-		-		-		-	
113.	Chloroform	3		8		4		4.7	
114.	1,2-Dichloroethane	-		-		-		-	
115.	1,1,1-Trichloroethane	-		-		-		-	
116.	Carbon tetrachloride	-		-		-		-	
117.	Bromodichloromethane	-		-		-		-	
118.	1,2-Dichloropropane	-		-		-		-	
120.	Trichloroethylene	-		-		-		-	
121.	Benzene	-		-		-		-	
123.	Dibromochloromethane	-		-		-		-	
124.	1,1,2-Trichloroethane	-		-		-		-	
126.	1,1,2,2-Tetrachloroethane	-		-		-		-	
127.	1,1,2,2-Tetrachloroethylene	2		1		3		2.0	
128.	Toluene	1		-		-		0.5	
129.	Chlorobenzene	-		-		-		-	
130.	Ethyl benzene	-		1		-		0.3	
201.	2-Chlorophenol	-		-		-		-	
203.	Phenol	-		18		-		5.1	
204.	2,4-Dimethylphenol	-		13		-		3.7	
205.	2,4-Dichlorophenol	-		-		-		-	
206.	2,4,6-Trichlorophenol	-		-		-		-	
210.	Pentachlorophenol	-		-		-		-	
301.	Dichlorobenzenes	-		-		-		-	
315.	Naphthalene	-		-		-		-	
326.	Diethyl phthalate	-		-		-		-	
331.	Anthracene/Phenanthrene	-		-		-		-	
333.	Di-n-butyl phthalate	11		-		-		5.0	
337.	Butyl benzyl phthalate	-		-		-		-	
338.	Bis (2-ethylhexyl) phthalate	-		-		-		-	

WARREN

SAMPLE NUMBER		211		221		232		Avg.	

Metals (µg/L)

501.	Antimony	3		-		2		1.9	
502.	Arsenic	-		-		-		-	
504.	Cadmium	-		-		6		1.6	
505.	Chromium	10		4		5		7.0	
506.	Copper	71		22		22		44.2	
507.	Lead	67		17		24		41.5	
508.	Manganese	240		270		230		245.9	
509.	Mercury	-		-		-		-	
510.	Nickel	8		4		3		5.6	
511.	Selenium	-		-		-		-	
512.	Silver	-		-		-		-	
514.	Zinc	320		89		140		207.2	

601.	Total Cyanides	-		-		-		-	

602.	Total Phenols	24		18		18		20.7	

Classical Parameters (mg/L)

701.	pH	7.3		6.8		6.6			
702.	T (^{o}C)	15.8		15.8		16.6			
703.	Ammonia	7.0		9.8		11.5		9.0	
704.	Oil and Grease	30		30		45		33.9	
705.	TSS	540		80		100		294.0	
706.	TOC	90		53		70		74.2	
707.	COD	240		120		150		182.3	
708.	BOD	100		70		95		90.2	

LENOX

SAMPLE NUMBER		204		214		225		Avg.	
	Organics (μg/L)								
104.	Vinyl chloride	-		-		-		-	
105.	Chloroethane	-		-		-		-	
108.	Trichlorofluoromethane	-		-		-		-	
109.	Acrylonitrile	-		-		-		-	
110.	1,1-Dichloroethylene	-		-		-		-	
111.	1,1-Dichloroethane	-		-		-		-	
112.	Trans-1,2-dichloroethylene	2		2		2		2.0	
113.	Chloroform	5		8		8		6.6	
114.	1,2-Dichloroethane	-		-		-		-	
115.	1,1,1-Trichloroethane	-		8		-		2.4	
116.	Carbon tetrachloride	-		-		-		-	
117.	Bromodichloromethane	-		-		-		-	
118.	1,2-Dichloropropane	-		-		-		-	
120.	Trichloroethylene	-		-		-		-	
121.	Benzene	-		-		-		-	
123.	Dibromochloromethane	-		-		-		-	
124.	1,1,2-Trichloroethane	-		-		-		-	
126.	1,1,2,2-Tetrachloroethane	-		-		-		-	
127.	1,1,2,2-Tetrachloroethylene	13		7		6		9.5	
128.	Toluene	2		3		1		2.1	
129.	Chlorobenzene	-		-		-		-	
130.	Ethyl benzene	2		16		1		5.9	
201.	2-Chlorophenol	-		-		-		-	
203.	Phenol	-		12		-		3.5	
204.	2,4-Dimethylphenol	-		-		-		-	
205.	2,4-Dichlorophenol	-		-		-		-	
206.	2,4,6-Trichlorophenol	-		-		-		-	
210.	Pentachlorophenol	52		47		15		41.5	
301.	Dichlorobenzenes	-		-		-		-	
315.	Naphthalene	-		-		-		-	
326.	Diethyl ohthalate	-		-		-		-	
331.	Anthracene/Phenanthrene	-		-		-		-	
333.	Di-n-butyl phthalate	-		-		19		4.6	
337.	Butyl benzyl phthalate	-		-		-		-	
338.	Bis (2-ethylhexyl) phthalate	-		-		-		-	

LENOX

SAMPLE NUMBER	204		214		225		Avg.	
Metals (µg/L)								
501. Antimony	-		-		2		0.5	
502. Arsenic	-		-		-		-	
504. Cadmium	-		-		-		-	
505. Chromium	830		85		68		423.8	
506. Copper	45		73		37		51.3	
507. Lead	55		34		57		49.3	
508. Manganese	120		160		310		178.2	
509. Mercury	-		-		-		-	
510. Nickel	8		3		4		5.5	
511. Selenium	4		-		-		1.8	
512. Silver	10		12		4		9.1	
514. Zinc	190		170		140		171.9	
601. Total Cyanides	-		-		-		-	
602. Total Phenols	44		53		31		43.5	

Classical Parameters (mg/L)

701. pH	6.7		6.7		6.7			
702. T (°C)	18.9		18.8		18.8			
703. Ammonia	6.2		8.5		5.5		22.6	
704. Oil and Grease	70		155		95		123.8	
705. TSS	100		80		200		121.3	
706. TOC	104		154		172		180.3	
707. COD	240		450		550		401.4	
708. BOD	130		260		420		245.4	

SAMPLE NUMBER		208		218		229		Avg.	
Organics (ug/L)									
104.	Vinyl chloride	-		-		-		-	
105.	Chloroethane	-		-		-		-	
108.	Trichlorofluoromethane	-		-		-		-	
109.	Acrylonitrile	-		-		-		-	
110.	1,1-Dichloroethylene	-		-		-		-	
111.	1,1-Dichloroethane	-		-		-		-	
112.	Trans-1,2-dichloroethylene	8		12		8		9.2	
113.	Chloroform	8		33		10		16.2	
114.	1,2-Dichloroethane	-		-		-		-	
115.	1,1,1-Trichloroethane	4		-		-		1.7	
116.	Carbon tetrachloride	-		-		-		-	
117.	Bromodichloromethane	-		-		-		-	
118.	1,2-Dichloropropane	-		-		-		-	
120.	Trichloroethylene	144		30		8		73.0	
121.	Benzene	-		-		-		-	
123.	Dibromochloromethane	-		-		-		-	
124.	1,1,2-Trichloroethane	-		-		-		-	
126.	1,1,2,2-Tetrachloroethane	-		-		-		-	
127.	1,1,2,2-Tetrachloroethylene	64		93		97		81.6	
128.	Toluene	8		2		1		4.3	
129.	Chlorobenzene	-		-		-		-	
130.	Ethyl benzene	-		-		-		-	
201.	2-Chlorophenol	-		-		-		-	
203.	Phenol	-		11		12		6.6	
204.	2,4-Dimethylphenol	-		-		-		-	
205.	2,4-Dichlorophenol	-		-		-		-	
206.	2,4,6-Trichlorophenol	-		-		-		-	
210.	Pentachlorophenol	-		-		-		-	
301.	Dichlorobenzenes	-		23		-		7.0	
315.	Naphthalene	-		-		-		-	
328.	Diethyl phthalate	-		-		-		-	
331.	Anthracene/Phenanthrene	-		-		-		-	
333.	Di-n-butyl phthalate	-		-		-		-	
337.	Butyl benzyl phthalate	-		47		70		33.0	
338.	Bis (2-ethylhexyl) phthalate	-		67		-		20.5	

DEKALB

SAMPLE NUMBER	208		218		229		Avg.	

Metals (µg/L)

501. Antimony	–		–		–		–	
502. Arsenic	–		–		–		–	
504. Cadmium	–		–		–		–	
505. Chromium	6		7		7		6.6	
506. Copper	29		85		52		52.2	
507. Lead	34		38		47		38.7	
508. Manganese	150		140		180		154.9	
509. Mercury	–		–		–		–	
510. Nickel	6		47		5		18.3	
511. Selenium	–		–		–		–	
512. Silver	–		–		–		–	
514. Zinc	120		150		140		134.5	

601. Total Cyanides	–		–		–		–	

602. Total Phenols	31		56		38		40.5	

Classical Parameters (mg/L)

701. pH	7.5		7.1		6.7			
702. T (°C)	19.2		19.8		20.1			
703. Ammonia	4.4		7.0		5.8		5.6	
704. Oil and Grease	60		100		50		69.6	
705. TSS	140		200		160		163.6	
706. TOC	112		320		144		184.0	
707. COD	430		1100		550		666.6	
708. BOD	205		385		215		262.6	

PEACHTREE

SAMPLE NUMBER		206		216		227		Avg.	
Organics (µg/L)									
104.	Vinyl chloride	–		–		–		–	
105.	Chloroethane	–		–		–		–	
108.	Trichlorofluoromethane	–		–		–		–	
109.	Acrylonitrile	–		–		–		–	
110.	1,1-Dichloroethylene	–		–		–		–	
111.	1,1-Dichloroethane	–		–		–		–	
112.	Trans-1,2-dichloroethylene	–		–		–		–	
113.	Chloroform	5		5		–		3.5	
114.	1,2-Dichloroethane	–		–		–		–	
115.	1,1,1-Trichloroethane	3		3		–		2.1	
116.	Carbon tetrachloride	–		–		–		–	
117.	Bromodichloromethane	–		–		–		–	
118.	1,2-Dichloropropane	–		–		–		–	
120.	Trichloroethylene	10		500		19		163.3	
121.	Benzene	1		–		1		0.7	
123.	Dibromochloromethane	–		–		–		–	
124.	1,1,2-Trichloroethane	–		–		–		–	
126.	1,1,2,2-Tetrachloroethane	–		–		–		–	
127.	1,1,2,2-Tetrachloroethylene	11		11		8		10.1	
128.	Toluene	3		3		6		3.9	
129.	Chlorobenzene	–		–		2		0.6	
130.	Ethyl benzene	3		2		8		4.1	
201.	2-Chlorophenol	–		–		–		–	
203.	Phenol	–		–		–		–	
204.	2,4-Dimethylphenol	–		–		–		–	
205.	2,4-Dichlorophenol	–		–		–		–	
206.	2,4,6-Trichlorophenol	–		–		–		–	
210.	Pentachlorophenol	15		16		12		14.4	
301.	Dichlorobenzenes	–		–		–		–	
315.	Naphthalene	–		–		–		–	
326.	Diethyl phthalate	–		–		–		–	
331.	Anthracene/Phenanthrene	–		–		–		–	
333.	Di-n-butyl phthalate	–		–		–		–	
337.	Butyl benzyl phthalate	–		–		–		–	
338.	Bis (2-ethylhexyl) phthalate	–		–		–		–	

PEACHTREE

SAMPLE NUMBER	206		216		227		Avg.	

Metals (µg/L)

501. Antimony	–		–		–		–	
502. Arsenic	–		–		–		–	
504. Cadmium	–		–		–		–	
505. Chromium	54		68		58		59.5	
506. Copper	68		71		75		71.0	
507. Lead	420		220		400		352.7	
508. Manganese	310		300		370		324.4	
509. Mercury	–		–		–		–	
510. Nickel	18		39		33		28.8	
511. Selenium	–		4		–		1.2	
512. Silver	13		20		6		13.1	
514. Zinc	680		930		780		785.9	

601. Total Cyanides	–		36		–		11.1	

602. Total Phenols	31		64		21		38.2	

Classical Parameters (mg/L)

701. pH	6.7		6.4		6.3			
702. T (^{o}C)	17.8		18.7		18.1			
703. Ammonia	5.1		6.8		5.3		5.7	
704. Oil and Grease	75		65		35		60.3	
705. TSS	240		260		160		229.9	
706. TOC	55		76		34		55.3	
707. COD	400		550		100		358.9	
708. BOD	80		115		40		79.1	

SIXTEENTH

SAMPLE NUMBER		205		215		226		Avg.	
		Organics (μg/L)							
104.	Vinyl chloride	–		–		–		–	
105.	Chloroethane	–		–		–		–	
108.	Trichlorofluoromethane	–		–		–		–	
109.	Acrylonitrile	–		–		–		–	
110.	1,1-Dichloroethylene	–		–		–		–	
111.	1,1-Dichloroethane	–		–		–		–	
112.	Trans-1,2-dichloroethylene	1		3		3		2.2	
113.	Chloroform	9		5		4		6.4	
114.	1,2-Dichloroethane	–		–		–		–	
115.	1,1,1-Trichloroethane	–		–		–		–	
116.	Carbon tetrachloride	2		1		–		1.1	
117.	Bromodichloromethane	–		–		–		–	
118.	1,2-Dichloropropane	–		–		–		–	
120.	Trichloroethylene	–		300		7		80.9	
121.	Benzene	3		–		–		1.3	
123.	Dibromochloromethane	–		–		–		–	
124.	1,1,2-Trichloroethane	–		–		–		–	
126.	1,1,2,2-Tetrachloroethane	–		–		–		–	
127.	1,1,2,2-Tetrachloroethylene	2		3		3		2.6	
128.	Toluene	2		1		–		1.1	
129.	Chlorobenzene	–		–		–		–	
130.	Ethyl benzene	–		–		–		–	
201.	2-Chlorophenol	–		–		–		–	
203.	Phenol	–		–		–		–	
204.	2,4-Dimethylphenol	–		–		–		–	
205.	2,4-Dichlorophenol	–		–		–		–	
206.	2,4,6-Trichlorophenol	–		–		–		–	
210.	Pentachlorophenol	14		63		17		27.8	
301.	Dichlorobenzenes	–		–		–		–	
315.	Naphthalene	–		–		–		–	
326.	Diethyl phthalate	–		–		–		–	
331.	Anthracene/Phenanthrene	–		–		–		–	
333.	Di-n-butyl phthalate	–		17		–		4.5	
337.	Butyl benzyl phthalate	–		–		–		–	
338.	Bis (2-ethylhexyl) phthalate	–		–		–		–	

SIXTEENTH

SAMPLE NUMBER	205		215		226		Avg.	

Metals (µg/L)

501. Antimony	–		–		2		0.6	
502. Arsenic	–		–		–		–	
504. Cadmium	–		–		–		–	
505. Chromium	120		120		98		113.1	
506. Copper	43		61		35		45.2	
507. Lead	130		120		70		108.6	
508. Manganese	190		190		170		183.7	
509. Mercury	–		–		–		–	
510. Nickel	10		11		5		8.7	
511. Selenium	–		4		–		1.0	
512. Silver	8		31		4		12.8	
514. Zinc	180		200		140		172.7	

601. Total Cyanides	–		–		–		–	

602. Total Phenols	36		49		25		36.0	

Classical Parameters (mg/L)

701. pH	6.5		6.7		6.6			
702. T (°C)	19.8		20.5		20.1			
703. Ammonia	3.05		4.9		5.4		4.3	
704. Oil and Grease	20		180		20		62.0	
705. TSS	200		300		120		201.2	
706. TOC	48		102		43		60.6	
707. COD	95		250		80		131.0	
708. BOD	45		150		65		78.8	

ENSIGN

SAMPLE NUMBER		210		220		231		Avg.	
	Organics (µg/L)								
104.	Vinyl chloride	–		–		3		1	
105.	Chloroethane	–		22		–		7.3	
108.	Trichlorofluoromethane	–		–		–		–	
109.	Acrylonitrile	–		–		–		–	
110.	1,1-Dichloroethylene	4		53		5		17.3	
111.	1,1-Dichloroethane	–		1		1		0.6	
112.	Trans-1,2-dichloroethylene	11		13		16		13.0	
113.	Chloroform	3		19		4		7.5	
114.	1,2-Dichloroethane	–		6		–		1.6	
115.	1,1,1-Trichloroethane	140		300		110		173.4	
116.	Carbon tetrachloride	–		12		–		3.2	
117.	Bromodichloromethane	–		–		–		–	
118.	1,2-Dichloropropane	3		–		–		1	
120.	Trichloroethylene	17		17		21		18.2	
121.	Benzene	1		1		1		1.0	
123.	Dibromochloromethane	–		–		–		–	
124.	1,1,2-Trichloroethane	–		–		–		–	
126.	1,1,2,2-Tetrachloroethane	–		–		–		–	
127.	1,1,2,2-Tetrachloroethylene	51		44		32		43.5	
128.	Toluene	98		95		21		74.2	
129.	Chlorobenzene	–		–		–		–	
130.	Ethyl benzene	170		130		11		111.9	
201.	2-Chlorophenol	–		–		–		–	
203.	Phenol	26		32		–		19.8	
204.	2,4-Dimethylphenol	18		14		–		11.6	
205.	2,4-Dichlorophenol	–		–		–		–	
206.	2,4,6-Trichlorophenol	–		–		–		–	
210.	Pentachlorophenol	–		–		–		–	
301.	Dichlorobenzenes	12		–		–		5.2	
315.	Naphthalene	–		–		–		–	
326.	Diethyl phthalate	–		–		–		–	
331.	Anthracene/Phenanthrene	–		–		–		–	
333.	Di-n-butyl phthalate	–		–		–		–	
337.	Butyl benzyl phthalate	600		400		32		377.3	
338.	Bis (2-ethylhexyl) phthalate	–		–		–		–	

ENSIGN

SAMPLE NUMBER	210		220		231		Avg.	

Metals (μg/L)

501. Antimony	*		*		*			
502. Arsenic	–		–		–		–	
504. Cadmium	150		68		–		83.5	
505. Chromium	16		78		18		33.0	
506. Copper	91		1100		38		342.5	
507. Lead	96		100		77		91.4	
508. Manganese	350		480		540		441.2	
509. Mercury	6		3		–		3.4	
510. Nickel	5		8		15		8.8	
511. Selenium	–		–		–		–	
512. Silver	12		27		4		13.6	
514. Zinc	160		140		140		148.7	

601. Total Cyanides	180		282		64		172.4	

602. Total Phenols	293		153		44		181.5	

* Apparent Interference: Not Analyzed

Classical Parameters (mg/L)

701. pH	7.1		6.8		6.6			
702. T (°C)	16.9		17.2		17.0			
703. Ammonia	4.0		5.3		3.3		4.1	
704. Oil and Grease	90		43		38		62.0	
705. TSS	120		80		60		91.5	
706. TOC	160		190		46		133.9	
707. COD	380		440		120		318.2	
708. BOD	250		280		80		207.1	

SURREY

SAMPLE NUMBER	209		219		230		Avg.	
Organics (µg/L)								
104. Vinyl chloride	–		–		–		–	
105. Chloroethane	–		–		–		–	
108. Trichlorofluoromethane	–		5		–		1.7	
109. Acrylonitrile	–		–		–		–	
110. 1,1-Dichloroethylene	–		7		2		3.0	
111. 1,1-Dichloroethane	–		2		2		1.0	
112. Trans-1,2-dichloroethylene	–		–		1		0.1	
113. Chloroform	3		7		8		5.0	
114. 1,2-Dichloroethane	–		–		–		–	
115. 1,1,1-Trichloroethane	20		150		36		73.2	
116. Carbon tetrachloride	–		37		–		14.8	
117. Bromodichloromethane	–		–		–		–	
118. 1,2-Dichloropropane	–		–		–		–	
120. Trichloroethylene	5		3		3		4.0	
121. Benzene	–		2		–		0.8	
123. Dibromochloromethane	–		–		–		–	
124. 1,1,2-Trichloroethane	–		–		–		–	
126. 1,1,2,2-Tetrachloroethane	–		–		1		0.3	
127. 1,1,2,2-Tetrachloroethylene	75		190		110		123.9	
128. Toluene	120		140		72		123.8	
129. Chlorobenzene	–		–		–		–	
130. Ethyl benzene	160		400		190		258.3	
201. 2-Chlorophenol	–		–		–		–	
203. Phenol	230		1000		400		551.8	
204. 2,4-Dimethylphenol	16		700		160		301.3	
205. 2,4-Dichlorophenol	–		–		–		–	
206. 2,4,6-Trichlorophenol	–		–		–		–	
210. Pentachlorophenol	–		23		–		9.2	
301. Dichlorobenzenes	–		–		–		–	
315. Naphthalene	150		290		25		194.9	
326. Diethyl phthalate	–		–		–		–	
331. Anthracene/Phenanthrene	–		–		–		–	
333. Di-n-butyl phthalate	83		–		–		42.7	
337. Butyl benzyl phthalate	900		300		250		604.0	
338. Bis (2-ethylhexyl) phthalate	130		220		220		173.7	

SURREY

SAMPLE NUMBER		209		219		230		Avg.	

Metals (µg/L)

501.	Antimony	*		*		*			
502.	Arsenic	–		5		–		2.0	
504.	Cadmium	–		43		–		17.1	
505.	Chromium	1700		2500		114		1880.6	
506.	Copper	49		120		27		75.4	
507.	Lead	670		2100		490		1224.5	
508.	Manganese	140		180		250		165.5	
509.	Mercury	2		2		–		1.8	
510.	Nickel	520		800		120		596.7	
511.	Selenium	–		–		–		–	
512.	Silver	9		8		6		8.3	
514.	Zinc	2500		4800		1800		3356.0	

601.	Total Cyanides	40		522		88		236.4	

602.	Total Phenols	331		554		631		446.1	

* Apparent Interference: Not Analyzed

Classical Parameters (mg/L)

701.	pH	7.7		7.6		7.7			
702.	T (°C)	24.6		25.1		18.9			
703.	Ammonia	2.8		5.2		1.25		3.6	
704.	Oil and Grease	770		80		35		430.7	
705.	TSS	240		740		180		434.1	
706.	TOC	98		350		73		196.3	
707.	COD	480		2700		310		1350.3	
708.	BOD	140		775		90		388.8	

DEFOORS

SAMPLE NUMBER		207		217		228		Avg.	
Organics (µg/L)									
104.	Vinyl chloride	–		–		–		–	
105.	Chloroethane	–		–		–		–	
108.	Trichlorofluoromethane	–		–		–		–	
109.	Acrylonitrile	–		–		–		–	
110.	1,1-Dichloroethylene	11		100		45		49.2	
111.	1,1-Dichloroethane	7		7		11		7.9	
112.	Trans-1,2-dichloroethylene	46		49		90		56.8	
113.	Chloroform	3		50		5		19.6	
114.	1,2-Dichloroethane	2		3		–		1.9	
115.	1,1,1-Trichloroethane	220		300		240		252.0	
116.	Carbon tetrachloride	82		260		120		151.7	
117.	Bromodichloromethane	–		–		–		–	
118.	1,2-Dichloropropane	–		–		–		–	
120.	Trichloroethylene	71		56		79		67.6	
121.	Benzene	2		2		1		1.8	
123.	Dibromochloromethane	–		–		–		–	
124.	1,1,2-Trichloroethane	–		2		–		0.7	
126.	1,1,2,2-Tetrachloroethane	–		–		–		–	
127.	1,1,2,2-Tetrachloroethylene	200		240		160		204.8	
128.	Toluene	58		78		51		63.3	
129.	Chlorobenzene	4		10		2		5.6	
130.	Ethyl benzene	250		300		78		228.9	
201.	2-Chlorophenol	–		20		–		6.7	
203.	Phenol	400		160		19		232.5	
204.	2,4-Dimethylphenol	230		78		20		130.9	
205.	2,4-Dichlorophenol	–		17		–		5.7	
206.	2,4,6-Trichlorophenol	–		17		–		5.7	
210.	Pentachlorophenol	48		40		75		51.3	
301.	Dichlorobenzenes	3000		2000		900		2187.7	
315.	Naphthalene	110		72		28		78.6	
326.	Diethyl phthalate	–		–		–		–	
331.	Anthracene/Phenanthrene	91		35		37		54.3	
333.	Di-n-butyl phthalate	130		85		22		90.4	
337.	Butyl benzyl phthalate	–		–		–		–	
338.	Bis (2-ethylhexyl) phthalate	75		150		–		84.1	

DEFOORS

SAMPLE NUMBER	207		217		228		Avg.	

Metals (µg/L)

501. Antimony	*		*		*			
502. Arsenic	9		10		5		8.5	
504. Cadmium	-		5		-		1.7	
505. Chromium	240		5700		320		2136.9	
506. Copper	180		220		42		163.0	
507. Lead	450		440		85		365.2	
508. Manganese	380		300		540		388.1	
509. Mercury	7		7		2		5.9	
510. Nickel	28		22		11		22.1	
511. Selenium	-		-		-		-	
512. Silver	31		24		18		25.7	
514. Zinc	590		510		280		493.4	

601. Total Cyanides	48		69		19		48.8	

602. Total Phenols	629		609		147		514.7	

* Apparent Interference: Not Analyzed

Classical Parameters (mg/L)

701. pH	7.0		7.8		6.2			
702. T (°C)	18.6		18.5		16.5			
703. Ammonia	9.5		10.5		3.1		8.4	
704. Oil and Grease	125		85		90		103.4	
705. TSS	580		800		110		550.9	
706. TOC	310		370		53		273.4	
707. COD	1300		1400		105		1068.0	
708. BOD	620		700		70		524.9	

TAP WATER

SAMPLE NUMBER		202		223				Avg.	
Organics (µg/L)									
104.	Vinyl chloride	-		-				-	
105.	Chloroethane	-		-				-	
108.	Trichlorofluoromethane	-		-				-	
109.	Acrylonitrile	-		-				-	
110.	1,1-Dichloroethylene	-		-				-	
111.	1,1-Dichloroethane	-		-				-	
112.	Trans-1,2-dichloroethylene	-		-				-	
113.	Chloroform	23		20				21.5	
114.	1,2-Dichloroethane	-		-				-	
115.	1,1,1-Trichloroethane	-		-				-	
116.	Carbon tetrachloride	-		-				-	
117.	Bromodichloromethane	3		4				3.5	
118.	1,2-Dichloropropane	-		-				-	
120.	Trichloroethylene	-		-				-	
121.	Benzene	-		-				-	
123.	Dibromochloromethane	-		1				0.5	
124.	1,1,2-Trichloroethane	-		-				-	
126.	1,1,2,2-Tetrachloroethane	-		-				-	
127.	1,1,2,2-Tetrachloroethylene	3		-				1.5	
128.	Toluene	-		-				-	
129.	Chlorobenzene	-		-				-	
130.	Ethyl benzene	-		-				-	
201.	2-Chlorophenol	-		-				-	
203.	Phenol	-		-				-	
204.	2,4-Dimethylphenol	-		-				-	
205.	2,4-Dichlorophenol	-		-				-	
206.	2,4,6-Trichlorophenol	-		-				-	
210.	Pentachlorophenol	-		-				-	
301.	Dichlorobenzenes	-		-				-	
315.	Naphthalene	-		-				-	
326.	Diethyl phthalate	-		-				-	
331.	Anthracene/Phenanthrene	-		-				-	
333.	Di-n-butyl phthalate	-		-				-	
337.	Butyl benzyl phthalate	-		-				-	
338.	Bis (2-ethylhexyl) phthalate	-		-				-	

TAP WATER

SAMPLE NUMBER		202		223				Avg.	

Metals (µg/L)

501.	Antimony	–		–				–	
502.	Arsenic	–		–				–	
504.	Cadmium	–		–				–	
505.	Chromium	–		–				–	
506.	Copper	21		24				22.5	
507.	Lead	13		13				13	
508.	Manganese	8		5				6.5	
509.	Mercury	–		–				–	
510.	Nickel	6		2				4.0	
511.	Selenium	–		–				–	
512.	Silver	–		–				–	
514.	Zinc	200		220				210.0	

601.	Total Cyanides	–		–				–	

602.	Total Phenols	–		–				–	

Classical Parameters (mg/L)

701.	pH	6.4		6.3					
702.	T (^{o}C)	16.2		16.9					
703.	Ammonia	–		–				–	
704.	Oil and Grease	–		–				–	
705.	TSS	–		–				–	
706.	TOC	4		5				4.5	
707.	COD	–		–				–	
708.	BOD	–		–				–	

POTW INFLUENT

SAMPLE NUMBER	201		212		222		Avg.	
Organics (μg/L)								
104. Vinyl chloride	-		-		-		-	
105. Chloroethane	-		-		-		-	
108. Trichlorofluoromethane	-		3		-		1	
109. Acrylonitrile	2		-		-		0.7	
110. 1,1-Dichloroethylene	10		15		-		8.6	
111. 1,1-Dichloroethane	-		-		-		-	
112. Trans-1,2-dichloroethylene	6		24		30		18.6	
113. Chloroform	5		12		5		7.1	
114. 1,2-Dichloroethane	1		-		-		0.4	
115. 1,1,1-Trichloroethane	93		180		12		95.9	
116. Carbon tetrachloride	-		-		-		-	
117. Bromodichloromethane	-		-		-		-	
118. 1,2-Dichloropropane	-		-		-		-	
120. Trichloroethylene	67		230		230		164.9	
121. Benzene	-		-		-		-	
123. Dibromochloromethane	-		-		-		-	
124. 1,1,2-Trichloroethane	-		-		-		-	
126. 1,1,2,2-Tetrachloroethane	-		-		-		-	
127. 1,1,2,2-Tetrachloroethylene	240		190		290		239.4	
128. Toluene	28		40		7		25.5	
129. Chlorobenzene	-		-		-		-	
130. Ethyl benzene	66		49		25		48.7	
201. 2-Chlorophenol	-		-		-		-	
203. Phenol	18		38		-		18.8	
204. 2,4-Dimethylphenol	14		14		-		9.9	
205. 2,4-Dichlorophenol	-		-		-		-	
206. 2,4,6-Trichlorophenol	-		-		-		-	
210. Pentachlorophenol	20		26		11		19.2	
301. Dichlorobenzenes	140		120		-		92.7	
315. Naphthalene	17		85		-		32.9	
326. Diethyl ohthalate	-		-		17		5.0	
331. Anthracene/Phenanthrene	-		-		-		-	
333. Di-n-butyl phthalate	11		-		-		4.4	
337. Butyl benzyl phthalate	61		160		13		77.3	
338. Bis (2-ethylhexyl) phthalate	-		-		-		-	

POTW INFLUENT

SAMPLE NUMBER		201		212		222		Avg.	

Metals (µg/L)

501.	Antimony	-		2		-		0.6	
502.	Arsenic	-		-		-		-	
504.	Cadmium	4		5		-		3.1	
505.	Chromium	84		74		54		72.1	
506.	Copper	56		51		42		50.4	
507.	Lead	130		110		170		135.6	
508.	Manganese	260		250		330		277.5	
509.	Mercury	2		-		-		0.8	
510.	Nickel	21		19		14		18.3	
511.	Selenium	-		-		-		-	
512.	Silver	19		10		6		12.4	
514.	Zinc	350		370		340		353.2	

601.	Total Cyanides	-		16		-		4.9	

602.	Total Phenols	105		162		28		99.8	

Classical Parameters (mg/L)

701.	pH	6.3		6.3		6.2			
702.	T (^{o}C)	17.5		17.5		17.9			
703.	Ammonia	6.4		8.8		7.4		7.4	
704.	Oil and Grease	30		30		25		28.5	
705.	TSS	120		140		160		137.9	
706.	TOC	61		94		50		67.9	
707.	COD	130		280		160		184.8	
708.	BOD	75		145		90		100.9	

FIELD BLANKS

SAMPLE NUMBER	233		234				Avg.	
Organics (μg/L)								
104. Vinyl chloride	-		-				-	
105. Chloroethane	-		-				-	
108. Trichlorofluoromethane	-		-				-	
109. Acrylonitrile	-		-				-	
110. 1,1-Dichloroethylene	-		-				-	
111. 1,1-Dichloroethane	-		-				-	
112. Trans-1,2-dichloroethylene	-		-				-	
113. Chloroform	3		4				3.5	
114. 1,2-Dichloroethane	-		-				-	
115. 1,1,1-Trichloroethane	-		-				-	
116. Carbon tetrachloride	-		-				-	
117. Bromodichloromethane	-		-				-	
118. 1,2-Dichloropropane	-		-				-	
120. Trichloroethylene	-		-				-	
121. Benzene	-		-				-	
123. Dibromochloromethane	-		1				0.5	
124. 1,1,2-Trichloroethane	-		-				-	
126. 1,1,2,2-Tetrachloroethane	-		-				-	
127. 1,1,2,2-Tetrachloroethylene	-		1				0.5	
128. Toluene	1		-				0.5	
129. Chlorobenzene	-		-				-	
130. Ethyl benzene	-		1				0.5	
201. 2-Chlorophenol	-		-				-	
203. Phenol	-		-				-	
204. 2,4-Dimethylphenol	-		-				-	
205. 2,4-Dichlorophenol	-		-				-	
206. 2,4,6-Trichlorophenol	-		-				-	
210. Pentachlorophenol	-		-				-	
301. Dichlorobenzenes	-		-				-	
315. Naphthalene	-		-				-	
326. Diethyl phthalate	-		-				-	
331. Anthracene/Phenanthrene	-		-				-	
333. Di-n-butyl phthalate	-		-				-	
337. Butyl benzyl phthalate	-		-				-	
338. Bis (2-ethylhexyl) phthalate	-		-				-	

FIELD BLANKS

SAMPLE NUMBER		233		234				Avg.	
	Metals (µg/L)								
501.	Antimony	–		–				–	
502.	Arsenic	–		–				–	
504.	Cadmium	–		–				–	
505.	Chromium	–		–				–	
506.	Copper	–		9				4.5	
507.	Lead	–		–				–	
508.	Manganese	–		–				–	
509.	Mercury	–		–				–	
510.	Nickel	–		–				–	
511.	Selenium	–		–				–	
512.	Silver	–		–				–	
514.	Zinc	–		11				5.5	
601.	Total Cyanides	–		–				–	
602.	Total Phenols	–		–				–	

Classical Parameters (mg/L)

701.	pH								
702.	T (^{o}C)								
703.	Ammonia	1.05		0.10				0.6	
704.	Oil and Grease	–		–				–	
705.	TSS	–		–				–	
706.	TOC	4		3				4	
707.	COD	–		–				–	
708.	BOD	–		–				–	

APPENDIX E

ANALYTICAL DATA BY CHEMICAL

This appendix contains the analytical data for all chemicals that were detected above the reporting limits. The data are tabulated by chemical and include measured concentrations, source identification, average concentrations, and the fraction of samples in which the pollutant was observed.

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104 VINYL CHLORIDE
                                                              AVERAGE
SITES                                                          WHEN                FRACTION
                     TU-WED    THUR-FRI        SAT-SUN        PRESENT   AVERAGE    PRESENT
-  NORTHSIDE              0           0              0            .0         .0        .00
S LENOX                   0           0              0            .0         .0        .00
O SIXTEENTH               0           0              0            .0         .0        .00
U PEACHTREE               0           0              0            .0         .0        .00
R DEFOORS                 0           0              0            .0         .0        .00
C DEKALB                  0           0              0            .0         .0        .00
E SURREY                  0           0              0            .0         .0        .00
S ENSIGN                  0           0              3           3.0        1.0        .33
_  WARREN                 0           0              0            .0         .0        .00

  TAP WATER               0                          0            .0         .0        .00
  POTW INFLUENT           0           0              0            .0         .0        .00

105 CHLOROETHANE
                                                              AVERAGE
SITES                                                          WHEN                FRACTION
                     TU-WED    THUR-FRI        SAT-SUN        PRESENT   AVERAGE    PRESENT
-  NORTHSIDE              0           0              0            .0         .0        .00
S LENOX                   0           0              0            .0         .0        .00
O SIXTEENTH               0           0              0            .0         .0        .00
U PEACHTREE               0           0              0            .0         .0        .00
R DEFOORS                 0           0              0            .0         .0        .00
C DEKALB                  0           0              0            .0         .0        .00
E SURREY                  0           0              0            .0         .0        .00
S ENSIGN                  0          22              0          22.0        7.3        .33
_  WARREN                 0           0              0            .0         .0        .00

  TAP WATER               0                          0            .0         .0        .00
  POTW INFLUENT           0           0              0            .0         .0        .00

108 TRICHLOROFLUOROMETHANE
                                                              AVERAGE
SITES                                                          WHEN                FRACTION
                     TU-WED    THUR-FRI        SAT-SUN        PRESENT   AVERAGE    PRESENT
-  NORTHSIDE              0           0              0            .0         .0        .00
S LENOX                   0           0              0            .0         .0        .00
O SIXTEENTH               0           0              0            .0         .0        .00
U PEACHTREE               0           0              0            .0         .0        .00
R DEFOORS                 0           0              0            .0         .0        .00
C DEKALB                  0           0              0            .0         .0        .00
E SURREY                  0           5              0           5.0        1.7        .33
S ENSIGN                  0           0              0            .0         .0        .00
_  WARREN                 0           0              0            .0         .0        .00

  TAP WATER               0                          0            .0         .0        .00
  POTW INFLUENT           0           3              0           3.0        1.0        .33
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109 ACHYLCNITRILE
                                                               AVERAGE
SITES                                                           WHEN              FRACTION
                        TU-WED   THUR-FRI      SAT-SUN      PRESENT  AVERAGE   PRESENT
_  NORTHSIDE                 0          0            0           .0       .0       .00
S LENOX                      0          0            0           .0       .0       .00
O SIXTEENTH                  0          0            0           .0       .0       .00
U PEACHTREE                  0          0            0           .0       .0       .00
R DEFOORS                    0          0            0           .0       .0       .00
C DEKALB                     0          0            0           .0       .0       .00
E SURREY                     0          0            0           .0       .0       .00
S ENSIGN                     0          0            0           .0       .0       .00
_  WARREN                    0          0            0           .0       .0       .00

  TAP WATER                  0                       0           .0       .0       .00
  POTW INFLUENT              2          0            0          2.0       .7       .33

110 1.1-DICHLOROETHYLENE
                                                               AVERAGE
SITES                                                           WHEN              FRACTION
                        TU-WED   THUR-FRI      SAT-SUN      PRESENT  AVERAGE   PRESENT
_  NORTHSIDE                 0          0            0           .0       .0       .00
S LENOX                      0          0            0           .0       .0       .00
O SIXTEENTH                  0          0            0           .0       .0       .00
U PEACHTREE                  0          0            0           .0       .0       .00
R DEFOORS                   11        100           45         52.0     52.0      1.00
C DEKALB                     0          0            0           .0       .0       .00
E SURREY                     0          7            2          4.5      3.0       .67
S ENSIGN                     4         53            5         20.7     20.7      1.00
_  WARREN                    0          0            0           .0       .0       .00

  TAP WATER                  0                       0           .0       .0       .00
  POTW INFLUENT             10         15            0         12.5      8.3       .67

111 1.1-DICHLORUETHANE
                                                               AVERAGE
SITES                                                           WHEN              FRACTION
                        TU-WED   THUR-FRI      SAT-SUN      PRESENT  AVERAGE   PRESENT
_  NORTHSIDE                 0          0            0           .0       .0       .00
S LENOX                      0          0            0           .0       .0       .00
O SIXTEENTH                  0          0            0           .0       .0       .00
U PEACHTREE                  0          0            0           .0       .0       .00
R DEFOORS                    7          7           11          8.3      8.3      1.00
C DEKALB                     0          0            0           .0       .0       .00
E SURREY                     0          2            2          2.0      1.3       .67
S ENSIGN                     0          1            1          1.0       .7       .67
_  WARREN                    0          0            0           .0       .0       .00

  TAP WATER                  0                       0           .0       .0       .00
  POTW INFLUENT              0          0            0           .0       .0       .00
```

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112 TRANS-1,2-DICHLOROETHYLENE

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
—	NORTHSIDE	0	0	0	.0	.0	.00
S	LENOX	2	2	2	2.0	2.0	1.00
O	SIXTEENTH	1	3	3	2.3	2.3	1.00
U	PEACHTREE	0	0	0	.0	.0	.00
R	DEFOORS	46	49	90	61.7	61.7	1.00
C	DEKALB	8	12	8	9.3	9.3	1.00
E	SURREY	0	0	1	1.0	.3	.33
S	ENSIGN	11	13	16	13.3	13.3	1.00
—	WARREN	0	0	0	.0	.0	.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	6	24	30	20.0	20.0	1.00

113 CHLOROFORM

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
—	NORTHSIDE	3	4	4	3.7	3.7	1.00
S	LENOX	5	8	8	7.0	7.0	1.00
O	SIXTEENTH	9	5	4	6.0	6.0	1.00
U	PEACHTREE	5	5	0	5.0	3.3	.67
R	DEFOORS	3	50	5	19.3	19.3	1.00
C	DEKALB	8	33	10	17.0	17.0	1.00
E	SURREY	3	7	8	6.0	6.0	1.00
S	ENSIGN	3	19	4	8.7	8.7	1.00
—	WARREN	3	8	4	5.0	5.0	1.00
	TAP WATER	23		20	21.5	21.5	1.00
	POTW INFLUENT	5	12	5	7.3	7.3	1.00

114 1,2-DICHLOROETHANE

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
—	NORTHSIDE	0	0	0	.0	.0	.00
S	LENOX	0	0	0	.0	.0	.00
O	SIXTEENTH	0	0	0	.0	.0	.00
U	PEACHTREE	0	0	0	.0	.0	.00
R	DEFOORS	2	3	0	2.5	1.7	.67
C	DEKALB	0	0	0	.0	.0	.00
E	SURREY	0	0	0	.0	.0	.00
S	ENSIGN	0	6	0	6.0	2.0	.33
—	WARREN	0	0	0	.0	.0	.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	1	0	0	1.0	.3	.33

```
115 1.1.1-TRICHLOROETHANE
                                                      AVERAGE
SITES                                                    WHEN            FRACTION
                          TU-WED  THUR-FRI   SAT-SUN  PRESENT  AVERAGE    PRESENT
-  NORTHSIDE                   3         1         0      2.0      1.3        .67
S LENOX                        0         8         0      8.0      2.7        .33
O SIXTEENTH                    0         0         0       .0       .0        .00
U PEACHTREE                    3         3         0      3.0      2.0        .67
R DEFOORS                    220       300       240    253.3    253.3       1.00
C DEKALB                       4         0         0      4.0      1.3        .33
E SURREY                      20       150        36     68.7     68.7       1.00
S ENSIGN                     140       300       110    183.3    183.3       1.00
-  WARREN                      0         0         0       .0       .0        .00

 TAP WATER                     0                   0       .0       .0        .00
 POTW INFLUENT                93       180        12     95.0     95.0       1.00

116 CARBON TETRACHLORIDE
                                                      AVERAGE
SITES                                                    WHEN            FRACTION
                          TU-WED  THUR-FRI   SAT-SUN  PRESENT  AVERAGE    PRESENT
-  NORTHSIDE                   0         0         0       .0       .0        .00
S LENOX                        0         0         0       .0       .0        .00
O SIXTEENTH                    2         1         0      1.5      1.0        .67
U PEACHTREE                    0         0         0       .0       .0        .00
R DEFOORS                     82       260       120    154.0    154.0       1.00
C DEKALB                       0         0         0       .0       .0        .00
E SURREY                       0        37         0     37.0     12.3        .33
S ENSIGN                       0        12         0     12.0      4.0        .33
-  WARREN                      0         0         0       .0       .0        .00

 TAP WATER                     0                   0       .0       .0        .00
 POTW INFLUENT                 0         0         0       .0       .0        .00

117 BROMODICHLOROMETHANE
                                                      AVERAGE
SITES                                                    WHEN            FRACTION
                          TU-WED  THUR-FRI   SAT-SUN  PRESENT  AVERAGE    PRESENT
-  NORTHSIDE                   0         0         0       .0       .0        .00
S LENOX                        0         0         0       .0       .0        .00
O SIXTEENTH                    0         0         0       .0       .0        .00
U PEACHTREE                    0         0         0       .0       .0        .00
R DEFOORS                      0         0         0       .0       .0        .00
C DEKALB                       0         0         0       .0       .0        .00
E SURREY                       0         0         0       .0       .0        .00
S ENSIGN                       0         0         0       .0       .0        .00
-  WARREN                      0         0         0       .0       .0        .00

 TAP WATER                     3                   4      3.5      3.5       1.00
 POTW INFLUENT                 0         0         0       .0       .0        .00
```

118 1.2-DICHLOROPROPANE

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	0	0	0	.0	.0	.00
S	LENOX	0	0	0	.0	.0	.00
O	SIXTEENTH	0	0	0	.0	.0	.00
U	PEACHTREE	0	0	0	.0	.0	.00
R	DEFOORS	0	0	0	.0	.0	.00
C	DEKALB	0	0	0	.0	.0	.00
E	SURREY	0	0	0	.0	.0	.00
S	ENSIGN	3	0	0	3.0	1.0	.33
-	WARREN	0	0	0	.0	.0	.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	0	0	0	.0	.0	.00

120 TRICHLOROETHYLENE

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	0	3	3	3.0	2.0	.67
S	LENOX	0	0	0	.0	.0	.00
O	SIXTEENTH	0	300	7	153.5	102.3	.67
U	PEACHTREE	10	500	19	176.3	176.3	1.00
R	DEFOORS	71	56	79	68.7	68.7	1.00
C	DEKALB	144	30	8	60.7	60.7	1.00
E	SURREY	5	3	3	3.7	3.7	1.00
S	ENSIGN	17	17	21	18.3	18.3	1.00
-	WARREN	0	0	0	.0	.0	.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	67	230	230	175.7	175.7	1.00

121 BENZENE

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	0	0	0	.0	.0	.00
S	LENOX	0	0	0	.0	.0	.00
O	SIXTEENTH	3	0	0	3.0	1.0	.33
U	PEACHTREE	1	0	1	1.0	.7	.67
R	DEFOORS	2	2	1	1.7	1.7	1.00
C	DEKALB	0	0	0	.0	.0	.00
E	SURREY	0	2	0	2.0	.7	.33
S	ENSIGN	1	1	1	1.0	1.0	1.00
-	WARREN	0	0	0	.0	.0	.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	0	0	0	.0	.0	.00

```
123 DIBROMOCHLOROMETHANE
                                                      AVERAGE
SITES                                                  WHEN              FRACTION
                    TU-WED    THUR-FRI    SAT-SUN    PRESENT  AVERAGE   PRESENT
- NORTHSIDE              0           0          0         .0       .0       .00
S LENOX                  0           0          0         .0       .0       .00
O SIXTEENTH              0           0          0         .0       .0       .00
U PEACHTREE              0           0          0         .0       .0       .00
R DEFOORS                0           0          0         .0       .0       .00
C DEKALB                 0           0          0         .0       .0       .00
E SURREY                 0           0          0         .0       .0       .00
S ENSIGN                 0           0          0         .0       .0       .00
_ WARREN                 0           0          0         .0       .0       .00

 TAP WATER               0                      1        1.0       .5       .50
 POTW INFLUENT           0           0          0         .0       .0       .00

124 1.1.2-TRICHLOROETHANE
                                                      AVERAGE
SITES                                                  WHEN              FRACTION
                    TU-WED    THUR-FRI    SAT-SUN    PRESENT  AVERAGE   PRESENT
- NORTHSIDE              0           0          0         .0       .0       .00
S LENOX                  C           0          0         .0       .0       .00
O SIXTEENTH              0           0          0         .0       .0       .00
U PEACHTREE              0           0          0         .0       .0       .00
R DEFOORS                0           2          0        2.0       .7       .33
C DEKALB                 0           0          0         .0       .0       .00
E SURREY                 0           0          0         .0       .0       .00
S ENSIGN                 0           0          0         .0       .0       .00
_ WARREN                 0           0          0         .0       .0       .00

 TAP WATER               0                      0         .0       .0       .00
 POTW INFLUENT           0           0          0         .0       .0       .00

126 1.1.2.2-TETRACHLOROETHANE
                                                      AVERAGE
SITES                                                  WHEN              FRACTION
                    TU-WED    THUR-FRI    SAT-SUN    PRESENT  AVERAGE   PRESENT
- NORTHSIDE              0           0          0         .0       .0       .00
S LENOX                  0           0          0         .0       .0       .00
O SIXTEENTH              0           0          0         .0       .0       .00
U PEACHTREE              0           0          0         .0       .0       .00
R DEFOORS                0           0          0         .0       .0       .00
C DEKALB                 0           0          0         .0       .0       .00
E SURREY                 0           0          1        1.0       .3       .33
S ENSIGN                 1           0          0        1.0       .3       .33
_ WARREN                 0           0          0         .0       .0       .00

 TAP WATER               0                      0         .0       .0       .00
 POTW INFLUENT           0           0          0         .0       .0       .00
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127 1.1.2.2-TETRACHLCROETHYLEN

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	10	9	7	8.7	8.7	1.00
S	LENOX	13	7	6	8.7	8.7	1.00
O	SIXTEENTH	2	3	3	2.7	2.7	1.00
U	PEACHTREE	11	11	8	10.0	10.0	1.00
R	DEFOURS	200	240	160	200.0	200.0	1.00
C	DEKALB	64	93	97	84.7	84.7	1.00
E	SURREY	75	190	110	125.0	125.0	1.00
S	ENSIGN	51	44	32	42.3	42.3	1.00
-	WARREN	2	1	3	2.0	2.0	1.00
	TAP WATER	3		0	3.0	1.5	.50
	POTW INFLUENT	240	190	290	240.0	240.0	1.00

128 TOLUENE

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	1	2	1	1.3	1.3	1.00
S	LENOX	2	3	1	2.0	2.0	1.00
O	SIXTEENTH	2	1	0	1.5	1.0	.67
U	PEACHTREE	3	3	6	4.0	4.0	1.00
R	DEFOURS	58	78	51	62.3	62.3	1.00
C	DEKALB	8	2	1	3.7	3.7	1.00
E	SURREY	120	140	72	110.7	110.7	1.00
S	ENSIGN	98	95	21	71.3	71.3	1.00
-	WARREN	1	0	0	1.0	.3	.33
	TAP WATER	3		0	.0	.0	.00
	POTW INFLUENT	28	40	7	25.0	25.0	1.00

129 CHLOROBENZENE

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	0	0	0	.0	.0	.00
S	LENOX	0	0	0	.0	.0	.00
O	SIXTEENTH	0	0	0	.0	.0	.00
U	PEACHTREE	0	0	2	2.0	.7	.33
R	DEFOURS	4	10	2	5.3	5.3	1.00
C	DEKALB	0	0	0	.0	.0	.00
E	SURREY	0	0	0	.0	.0	.00
S	ENSIGN	0	0	0	.0	.0	.00
-	WARREN	0	0	0	.0	.0	.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	0	0	0	.0	.0	.00

```
130 ETHYL BENZENE
                                                        AVERAGE
SITES                                                     WHEN               FRACTION
                   TU-WED   THUR-FRI     SAT-SUN       PRESENT   AVERAGE    PRESENT
- NORTHSIDE             0          0           0           .0        .0        .00
S LENOX                 2         16           1          6.3       6.3       1.00
O SIXTEENTH             0          0           0           .0        .0        .00
U PEACHTREE             3          2           8          4.3       4.3       1.00
R DEFOORS             250        300          78        209.3     209.3       1.00
C DEKALB                0          0           0           .0        .0        .00
E SURREY              160        400         190        250.0     250.0       1.00
S ENSIGN              170        130          11        103.7     103.7       1.00
- WARREN                0          1           0          1.0        .3        .33

  TAP WATER             0                      0           .0        .0        .00
  POTW INFLUENT        66         49          25         46.7      46.7       1.00

201 2-CHLOROPHENOL
                                                        AVERAGE
SITES                                                     WHEN               FRACTION
                   TU-WED   THUR-FRI     SAT-SUN       PRESENT   AVERAGE    PRESENT
- NORTHSIDE             0          0           0           .0        .0        .00
S LENOX                 0          0           0           .0        .0        .00
O SIXTEENTH             0          0           0           .0        .0        .00
U PEACHTREE             0          0           0           .0        .0        .00
R DEFOORS               0         20           0         20.0       6.7        .33
C DEKALB                0          0           0           .0        .0        .00
E SURREY                0          0           0           .0        .0        .00
S ENSIGN                0          0           0           .0        .0        .00
- WARREN                0          0           0           .0        .0        .00

  TAP WATER             0                      0           .0        .0        .00
  POTW INFLUENT         0          0           0           .0        .0        .00

203 PHENOL
                                                        AVERAGE
SITES                                                     WHEN               FRACTION
                   TU-WED   THUR-FRI     SAT-SUN       PRESENT   AVERAGE    PRESENT
- NORTHSIDE             0          0           0           .0        .0        .00
S LENOX                 0         12           0         12.0       4.0        .33
O SIXTEENTH             0          0           0           .0        .0        .00
U PEACHTREE             0          0           0           .0        .0        .00
R DEFOORS             400        160          19        193.0     193.0       1.00
C DEKALB                0         11          12         11.5       7.7        .67
E SURREY              230       1000         400        543.3     543.3       1.00
S ENSIGN               26         32           0         29.0      19.3        .67
- WARREN                0         18           0         18.0       6.0        .33

  TAP WATER             0                      0           .0        .0        .00
  POTW INFLUENT        18         38           0         28.0      18.7        .67
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204 2,4-DIMETHYLPHENOL                                    AVERAGE
                                                           WHEN               FRACTION
SITES                 TU-WED   THUR-FRI    SAT-SUN      PRESENT   AVERAGE    PRESENT
- NORTHSIDE                0          0          0           .0        .0        .00
S LENOX                    0          0          0           .0        .0        .00
O SIXTEENTH                0          0          0           .0        .0        .00
U PEACHTREE                0          0          0           .0        .0        .00
R DEFOORS                230         78         20        109.3     109.3       1.00
C DEKALB                   0          0          0           .0        .0        .00
E SURREY                  16        700        160        292.0     292.0       1.00
S ENSIGN                  18         14          0         16.0      10.7        .67
  WARREN                   0         13          0         13.0       4.3        .33
-
  TAP WATER                0                     0           .0        .0        .00
  POTW INFLUENT           14         14          0         14.0       9.3        .67

205 2,4-DICHLOROPHENOL                                    AVERAGE
                                                           WHEN               FRACTION
SITES                 TU-WED   THUR-FRI    SAT-SUN      PRESENT   AVERAGE    PRESENT
- NORTHSIDE                0          0          0           .0        .0        .00
S LENOX                    0          0          0           .0        .0        .00
O SIXTEENTH                0          0          0           .0        .0        .00
U PEACHTREE                0          0          0           .0        .0        .00
R DEFOORS                  0         17          0         17.0       5.7        .33
C DEKALB                   0          0          0           .0        .0        .00
E SURREY                   0          0          0           .0        .0        .00
S ENSIGN                   0          0          0           .0        .0        .00
  WARREN                   0          0          0           .0        .0        .00
-
  TAP WATER                0                     0           .0        .0        .00
  POTW INFLUENT            0          0          0           .0        .0        .00

206 2,4,6-TRICHLOROPHENOL                                 AVERAGE
                                                           WHEN               FRACTION
SITES                 TU-WED   THUR-FRI    SAT-SUN      PRESENT   AVERAGE    PRESENT
- NORTHSIDE                0          0          0           .0        .0        .00
S LENOX                    0          0          0           .0        .0        .00
O SIXTEENTH                0          0          0           .0        .0        .00
U PEACHTREE                0          0          0           .0        .0        .00
R DEFOORS                  0         17          0         17.0       5.7        .33
C DEKALB                   0          0          0           .0        .0        .00
E SURREY                   0          0          0           .0        .0        .00
S ENSIGN                   0          0          0           .0        .0        .00
  WARREN                   0          0          0           .0        .0        .00
-
  TAP WATER                0                     0           .0        .0        .00
  POTW INFLUENT            0          0          0           .0        .0        .00
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210 PENTACHLOROPHENOL

SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
- NORTHSIDE	18	12	0	15.0	10.0	.67
S LENOX	52	47	15	38.0	38.0	1.00
O SIXTEENTH	14	63	17	31.3	31.3	1.00
U PEACHTREE	15	16	12	14.3	14.3	1.00
R DEFOORS	48	40	75	54.3	54.3	1.00
C DEKALB	0	0	0	.0	.0	.00
E SURREY	0	23	0	23.0	7.7	.33
S ENSIGN	0	0	0	.0	.0	.00
- WARREN	0	0	0	.0	.0	.00
TAP WATER	0		0	.0	.0	.00
POTW INFLUENT	20	26	11	19.0	19.0	1.00

301 DICHLOROBENZENES

SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
- NORTHSIDE	0	0	0	.0	.0	.00
S LENOX	0	0	0	.0	.0	.00
O SIXTEENTH	0	0	0	.0	.0	.00
U PEACHTREE	0	0	0	.0	.0	.00
R DEFOORS	3000	2000	900	1966.7	1966.7	1.00
C DEKALB	0	23	0	23.0	7.7	.33
E SURREY	0	0	0	.0	.0	.00
S ENSIGN	12	0	0	12.0	4.0	.33
- WARREN	0	0	0	.0	.0	.00
TAP WATER	0		0	.0	.0	.00
POTW INFLUENT	140	120	0	130.0	86.7	.67

315 NAPHTHALENE

SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
- NORTHSIDE	0	0	0	.0	.0	.00
S LENOX	0	0	0	.0	.0	.00
O SIXTEENTH	0	0	0	.0	.0	.00
U PEACHTREE	0	0	0	.0	.0	.00
R DEFOORS	110	72	28	70.0	70.0	1.00
C DEKALB	0	0	0	.0	.0	.00
E SURREY	150	290	25	155.0	155.0	1.00
S ENSIGN	0	0	0	.0	.0	.00
- WARREN	0	0	0	.0	.0	.00
TAP WATER	0		0	.0	.0	.00
POTW INFLUENT	17	85	0	51.0	34.0	.67

326 DIETHYL PHTHALATE

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	0	0	0	.0	.0	.00
S	LENOX	0	0	0	.0	.0	.00
O	SIXTEENTH	0	0	0	.0	.0	.00
U	PEACHTREE	0	0	0	.0	.0	.00
R	DEFOORS	0	0	0	.0	.0	.00
C	DEKALB	0	0	0	.0	.0	.00
E	SURREY	0	0	0	.0	.0	.00
S	ENSIGN	0	0	0	.0	.0	.00
-	WARREN	0	0	0	.0	.0	.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	0	0	17	17.0	5.7	.33

331 ANTHRACENE/PHENANTHRENE

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	0	0	0	.0	.0	.00
S	LENOX	0	0	0	.0	.0	.00
O	SIXTEENTH	0	0	0	.0	.0	.00
U	PEACHTREE	0	0	0	.0	.0	.00
R	DEFOORS	91	35	37	54.3	54.3	1.00
C	DEKALB	0	0	0	.0	.0	.00
E	SURREY	0	0	0	.0	.0	.00
S	ENSIGN	0	0	0	.0	.0	.00
-	WARREN	0	0	0	.0	.0	.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	0	0	0	.0	.0	.00

333 DI-N-BUTYL PHTHALATE

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	0	0	0	.0	.0	.00
S	LENOX	0	0	19	19.0	6.3	.33
O	SIXTEENTH	0	17	0	17.0	5.7	.33
U	PEACHTREE	0	0	0	.0	.0	.00
R	DEFOORS	130	85	22	79.0	79.0	1.00
C	DEKALB	0	0	0	.0	.0	.00
E	SURREY	83	0	0	83.0	27.7	.33
S	ENSIGN	0	0	0	.0	.0	.00
-	WARREN	11	0	0	11.0	3.7	.33
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	11	0	0	11.0	3.7	.33

337 BUTYL BENZYL PHTHALATE

SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
- NORTHSIDE	0	0	0	.0	.0	.00
S LENOX	0	0	0	.0	.0	.00
O SIXTEENTH	0	0	0	.0	.0	.00
U PEACHTREE	0	0	0	.0	.0	.00
R DEFOORS	0	0	0	.0	.0	.00
C DEKALB	0	47	70	58.5	39.0	.67
E SURREY	900	300	250	483.3	483.3	1.00
S ENSIGN	600	400	32	344.0	344.0	1.00
_ WARREN	0	0	0	.0	.0	.00
TAP WATER	0		0	.0	.0	.00
POTW INFLUENT	61	163	13	78.0	78.0	1.00

338 BIS(2-ETHYLHEXYL)PHTHALATE

SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
- NORTHSIDE	0	0	0	.0	.0	.00
S LENOX	0	0	0	.0	.0	.00
O SIXTEENTH	0	0	0	.0	.0	.00
U PEACHTREE	0	0	0	.0	.0	.00
R DEFLORS	75	150	0	112.5	75.0	.67
C DEKALB	0	67	0	67.0	22.3	.33
E SURREY	130	220	220	190.0	190.0	1.00
S ENSIGN	0	0	0	.0	.0	.00
_ WARREN	0	0	0	.0	.0	.00
TAP WATER	0		0	.0	.0	.00
POTW INFLUENT	0	0	0	.0	.0	.00

501 ANTIMONY

SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
- NORTHSIDE	0	0	0	.0	.0	.00
S LENOX	0	0	2	2.0	.7	.33
O SIXTEENTH	0	0	2	2.0	.7	.33
U PEACHTREE	0	0	0	.0	.0	.00
R DEFOURS						.00
C DEKALB	0	0	0	.0	.0	.00
E SURREY						.00
S ENSIGN						.00
_ WARREN	3	0	2	2.5	1.7	.67
TAP WATER	0		0	.0	.0	.00
POTW INFLUENT	0	2	0	2.0	.7	.33

502 ARSENIC

SITES		TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	0	0	0	.0	.0	.00
S	LENOX	0	0	0	.0	.0	.00
O	SIXTEENTH	0	0	0	.0	.0	.00
U	PEACHTREE	0	0	0	.0	.0	.00
R	DEFOORS	9	10	5	8.0	8.0	1.00
C	DEKALB	0	0	0	.0	.0	.00
E	SURREY	0	0	0	.0	.0	.00
S	ENSIGN	0	5	0	5.0	1.7	.33
-	WARREN	0	0	0	.0	.0	.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	0	0	0	.0	.0	.00

504 CADMIUM

SITES		TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	0	0	0	.0	.0	.00
S	LENOX	0	0	0	.0	.0	.00
O	SIXTEENTH	0	0	0	.0	.0	.00
U	PEACHTREE	0	0	0	.0	.0	.00
R	DEFOORS	0	5	0	5.0	1.7	.33
C	DEKALB	0	0	0	.0	.0	.00
E	SURREY	0	43	0	43.0	14.3	.33
S	ENSIGN	150	68	0	109.0	72.7	.67
-	WARREN	0	0	6	6.0	2.0	.33
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	4	5	0	4.5	3.0	.67

505 CHROMIUM

SITES		TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	49	16	10	25.0	25.0	1.00
S	LENOX	830	85	68	327.7	327.7	1.00
O	SIXTEENTH	120	120	98	112.7	112.7	1.00
U	PEACHTREE	54	68	58	60.0	60.0	1.00
R	DEFOORS	240	5700	320	2086.7	2086.7	1.00
C	DEKALB	6	7	7	6.7	6.7	1.00
E	SURREY	1700	2500	114	1438.0	1438.0	1.00
S	ENSIGN	16	78	18	37.3	37.3	1.00
-	WARREN	10	4	5	6.3	6.3	1.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	84	74	54	70.7	70.7	1.00

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506 COPPER
                                                             AVERAGE
SITES                                                         WHEN              FRACTION
                       TU-WED    THUR-FRI      SAT-SUN      PRESENT  AVERAGE    PRESENT
-  NORTHSIDE              28          52            35        38.3     38.3      1.00
S LENOX                   45          73            37        51.7     51.7      1.00
O SIXTEENTH               43          61            35        46.3     46.3      1.00
U PEACHTREE               68          71            75        71.3     71.3      1.00
R DEFOORS                180         220            42       147.3    147.3      1.00
C DEKALB                  29          85            52        55.3     55.3      1.00
E SURREY                  49         120            27        65.3     65.3      1.00
S ENSIGN                  91        1100            38       409.7    409.7      1.00
_  WARREN                 71          22            22        38.3     38.3      1.00

  TAP WATER               21                        24        22.5     22.5      1.00
  POTW INFLUENT           56          51            42        49.7     49.7      1.00

507 LEAD
                                                             AVERAGE
SITES                                                         WHEN              FRACTION
                       TU-WED    THUR-FRI      SAT-SUN      PRESENT  AVERAGE    PRESENT
-  NORTHSIDE              35          63            27        41.7     41.7      1.00
S LENOX                   55          34            57        48.7     48.7      1.00
O SIXTEENTH              130         120            70       106.7    106.7      1.00
U PEACHTREE              420         220           400       346.7    346.7      1.00
R DEFOORS                450         440            85       325.0    325.0      1.00
C DEKALB                  34          38            47        39.7     39.7      1.00
E SURREY                 670        2100           490      1086.7   1086.7      1.00
S ENSIGN                  96         100            77        91.0     91.0      1.00
_  WARREN                 67          17            24        36.0     36.0      1.00

  TAP WATER               13                        13        13.0     13.0      1.00
  POTW INFLUENT          130         110           170       136.7    136.7      1.00

508 MANGANESE
                                                             AVERAGE
SITES                                                         WHEN              FRACTION
                       TU-WED    THUR-FRI      SAT-SUN      PRESENT  AVERAGE    PRESENT
-  NORTHSIDE             160         200           180       180.0    180.0      1.00
S LENOX                  120         160           310       196.7    196.7      1.00
O SIXTEENTH              190         190           170       183.3    183.3      1.00
U PEACHTREE              310         300           370       326.7    326.7      1.00
R DEFOORS                380         300           540       406.7    406.7      1.00
C DEKALB                 150         140           180       156.7    156.7      1.00
E SURREY                 140         180           250       190.0    190.0      1.00
S ENSIGN                 350         480           540       456.7    456.7      1.00
_  WARREN                240         270           230       246.7    246.7      1.00

  TAP WATER                8                         5         6.5      6.5      1.00
  POTW INFLUENT          260         250           330       280.0    280.0      1.00
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509 MERCURY
                                                        AVERAGE
SITES                                                    WHEN              FRACTION
                    TU-WED   THUR-FRI      SAT-SUN    PRESENT   AVERAGE    PRESENT
-  NORTHSIDE             0          0            0         .0        .0        .00
S LENOX                  0          0            0         .0        .0        .00
O SIXTEENTH              0          0            0         .0        .0        .00
U PEACHTREE              0          0            0         .0        .0        .00
R DEFOORS                7          7            2        5.3       5.3       1.00
C DEKALB                 0          0            0         .0        .0        .00
E SURREY                 2          2            0        2.0       1.3        .67
S ENSIGN                 6          3            0        4.5       3.0        .67
_  WARREN                0          0            0         .0        .0        .00

 TAP WATER               0                       0         .0        .0        .00
 POTW INFLUENT           2          0            0        2.0        .7        .33

510 NICKEL
                                                        AVERAGE
SITES                                                    WHEN              FRACTION
                    TU-WED   THUR-FRI      SAT-SUN    PRESENT   AVERAGE    PRESENT
-  NORTHSIDE             4          2            3        3.0       3.0       1.00
S LENOX                  8          3            4        5.0       5.0       1.00
O SIXTEENTH             10         11            5        8.7       8.7       1.00
U PEACHTREE             18         39           33       30.0      30.0       1.00
R DEFCORS               28         22           11       20.3      20.3       1.00
C DEKALB                 6         47            5       19.3      19.3       1.00
E SURREY               520        800          120      480.0     480.0       1.00
S ENSIGN                 5          8           15        9.3       9.3       1.00
_  WARREN                8          4            3        5.0       5.0       1.00

 TAP WATER               6                       2        4.0       4.0       1.00
 POTW INFLUENT          21         19           14       18.0      18.0       1.00

511 SELENIUM
                                                        AVERAGE
SITES                                                    WHEN              FRACTION
                    TU-WED   THUR-FRI      SAT-SUN    PRESENT   AVERAGE    PRESENT
-  NORTHSIDE             0          0            0         .0        .0        .00
S LENOX                  4          0            0        4.0       1.3        .33
O SIXTEENTH              0          4            0        4.0       1.3        .33
U PEACHTREE              0          4            0        4.0       1.3        .33
R DEFOORS                0          0            0         .0        .0        .00
C DEKALB                 0          0            0         .0        .0        .00
E SURREY                 0          0            0         .0        .0        .00
S ENSIGN                 0          0            0         .0        .0        .00
_  WARREN                0          0            0         .0        .0        .00

 TAP WATER               0                       0         .0        .0        .00
 POTW INFLUENT           0          0            0         .0        .0        .00
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512 SILVER

SITES		TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	10	7	0	8.5	5.7	.67
S	LENOX	10	12	4	8.7	8.7	1.00
O	SIXTEENTH	8	31	4	14.3	14.3	1.00
U	PEACHTREE	13	20	6	13.0	13.0	1.00
R	DEFOORS	31	24	18	24.3	24.3	1.00
C	DEKALB	0	0	0	.0	.0	.00
E	SURREY	9	8	6	7.7	7.7	1.00
S	ENSIGN	12	27	4	14.3	14.3	1.00
_	WARREN	0	0	0	.0	.0	.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	19	10	6	11.7	11.7	1.00

514 ZINC

SITES		TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	120	150	130	133.3	133.3	1.00
S	LENOX	190	170	140	166.7	166.7	1.00
O	SIXTEENTH	180	200	140	173.3	173.3	1.00
U	PEACHTREE	680	930	780	796.7	796.7	1.00
R	DEFOORS	590	510	280	460.0	460.0	1.00
C	DEKALB	120	150	140	136.7	136.7	1.00
E	SURREY	2500	4800	1800	3033.3	3033.3	1.00
S	ENSIGN	160	140	140	146.7	146.7	1.00
_	WARREN	320	89	140	183.0	183.0	1.00
	TAP WATER	200		220	210.0	210.0	1.00
	POTW INFLUENT	350	370	340	353.3	353.3	1.00

601 TOTAL CYANIDES

SITES		TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	24	0	0	24.0	8.0	.33
S	LENOX	0	0	0	.0	.0	.00
O	SIXTEENTH	0	0	0	.0	.0	.00
U	PEACHTREE	0	36	0	36.0	12.0	.33
R	DEFOORS	48	69	19	45.3	45.3	1.00
C	DEKALB	0	0	0	.0	.0	.00
E	SURREY	40	522	88	216.7	216.7	1.00
S	ENSIGN	180	282	64	175.3	175.3	1.00
_	WARREN	0	0	0	.0	.0	.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	0	16	0	16.0	5.3	.33

602 TOTAL PHENOLS

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
–	NORTHSIDE	17	22	22	20.3	20.3	1.00
S	LENOX	44	53	31	42.7	42.7	1.00
O	SIXTEENTH	36	49	25	36.7	36.7	1.00
U	PEACHTREE	31	64	21	38.7	38.7	1.00
R	DEFCORS	629	609	147	461.7	461.7	1.00
C	DEKALB	31	56	38	41.7	41.7	1.00
E	SURREY	331	554	631	505.3	505.3	1.00
S	ENSIGN	293	153	44	163.3	163.3	1.00
–	WARREN	24	18	18	20.0	20.0	1.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	105	162	28	98.3	98.3	1.00

701 PH

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
–	NORTHSIDE	7	7	7	6.6	6.6	1.00
S	LENOX	7	7	7	6.7	6.7	1.00
O	SIXTEENTH	7	7	7	6.6	6.6	1.00
U	PEACHTREE	7	6	6	6.5	6.5	1.00
R	DEFCORS	7	8	6	7.0	7.0	1.00
C	DEKALB	8	7	7	7.1	7.1	1.00
E	SURREY	8	8	8	7.7	7.7	1.00
S	ENSIGN	7	7	7	6.8	6.8	1.00
–	WARREN	7	7	7	6.9	6.9	1.00
	TAP WATER	6		6	6.3	6.3	1.00
	POTW INFLUENT	6	6	6	6.3	6.3	1.00

702 T(C)

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
–	NORTHSIDE	17	17	16	16.6	16.6	1.00
S	LENOX	19	19	6	14.6	14.6	1.00
O	SIXTEENTH	20	21	20	20.1	20.1	1.00
U	PEACHTREE	18	19	18	18.2	18.2	1.00
R	DEFCORS	19	19	17	17.9	17.9	1.00
C	DEKALB	19	20	20	19.7	19.7	1.00
E	SURREY	25	25	19	22.9	22.9	1.00
S	ENSIGN	17	17	17	17.0	17.0	1.00
–	WARREN	16	16	17	16.1	16.1	1.00
	TAP WATER	16		17	16.5	16.5	1.00
	POTW INFLUENT	18	18	18	17.6	17.6	1.00

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703 AMMONIA                                               AVERAGE
                                                            WHEN               FRACTION
SITES               TU-WED   THUR-FRI      SAT-SUN     PRESENT   AVERAGE    PRESENT
- NORTHSIDE              8          9           11         9.1       9.1       1.00
S LENOX                  9          6           70        28.0      28.0       1.00
O SIXTEENTH              3          5            5         4.4       4.4       1.00
U PEACHTREE              5          7            5         5.7       5.7       1.00
R DEFOORS               10         11            3         7.7       7.7       1.00
C DEKALB                 4          7            6         5.7       5.7       1.00
E SURREY                 3          5            1         3.1       3.1       1.00
S ENSIGN                 4          5            3         4.2       4.2       1.00
- WARREN                 7         10           12         9.4       9.4       1.00

  TAP WATER              0                       0          .0        .0        .00
  POTW INFLUENT          6          9            7         7.5       7.5       1.00

704 OIL AND GREASE                                        AVERAGE
                                                            WHEN               FRACTION
SITES               TU-WED   THUR-FRI      SAT-SUN     PRESENT   AVERAGE    PRESENT
- NORTHSIDE             20         35           32        29.0      29.0       1.00
S LENOX                155         95          100       116.7     116.7       1.00
O SIXTEENTH             20        180           20        73.3      73.3       1.00
U PEACHTREE             75         65           35        58.3      58.3       1.00
R DEFOORS              125         85           90       100.0     100.0       1.00
C DEKALB                60        100           50        70.0      70.0       1.00
E SURREY               770         80           35       295.0     295.0       1.00
S ENSIGN                90         43           38        57.0      57.0       1.00
- WARREN                30         30           45        35.0      35.0       1.00

  TAP WATER              0                       0          .0        .0        .00
  POTW INFLUENT         30         30           25        28.3      28.3       1.00

705 TSS                                                   AVERAGE
                                                            WHEN               FRACTION
SITES               TU-WED   THUR-FRI      SAT-SUN     PRESENT   AVERAGE    PRESENT
- NORTHSIDE             60        100           70        76.7      76.7       1.00
S LENOX                 80        200          104       128.0     128.0       1.00
O SIXTEENTH            200        300          120       206.7     206.7       1.00
U PEACHTREE            240        260          160       220.0     220.0       1.00
R DEFOORS              580        800          110       496.7     496.7       1.00
C DEKALB               140        200          160       166.7     166.7       1.00
E SURREY               240        740          180       386.7     386.7       1.00
S ENSIGN               120         80           60        86.7      86.7       1.00
- WARREN               540         80          100       240.0     240.0       1.00

  TAP WATER              0                       0          .0        .0        .00
  POTW INFLUENT        120        140          160       140.0     140.0       1.00
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706 TCC

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	33	73	69	58.3	58.3	1.00
S	LENOX	154	172	240	188.7	188.7	1.00
O	SIXTEENTH	48	102	43	64.3	64.3	1.00
U	PEACHTREE	55	76	34	55.0	55.0	1.00
R	DEFOORS	310	370	53	244.3	244.3	1.00
C	DEKALB	112	320	144	192.0	192.0	1.00
E	SURREY	98	350	73	173.7	173.7	1.00
S	ENSIGN	160	190	46	132.0	132.0	1.00
-	WARREN	90	53	70	71.0	71.0	1.00
	TAP WATER	4		5	4.5	4.5	1.00
	POTW INFLUENT	61	94	50	68.3	68.3	1.00

707 COD

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	80	810	180	356.7	356.7	1.00
S	LENOX	450	550	130	376.7	376.7	1.00
O	SIXTEENTH	95	250	80	141.7	141.7	1.00
U	PEACHTREE	400	550	100	350.0	350.0	1.00
R	DEFOORS	1300	1400	105	935.0	935.0	1.00
C	DEKALB	430	1100	550	693.3	693.3	1.00
E	SURREY	480	2700	310	1163.3	1163.3	1.00
S	ENSIGN	380	440	120	313.3	313.3	1.00
-	WARREN	240	120	150	170.0	170.0	1.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	130	280	160	190.0	190.0	1.00

708 BCD

	SITES	TU-WED	THUR-FRI	SAT-SUN	AVERAGE WHEN PRESENT	AVERAGE	FRACTION PRESENT
-	NORTHSIDE	50	80	95	75.0	75.0	1.00
S	LENOX	260	420	7	228.9	228.9	1.00
O	SIXTEENTH	45	150	65	86.7	86.7	1.00
U	PEACHTREE	80	115	40	78.3	78.3	1.00
R	DEFOORS	620	700	70	463.3	463.3	1.00
C	DEKALB	205	385	215	268.3	268.3	1.00
E	SURREY	140	775	90	335.0	335.0	1.00
S	ENSIGN	250	280	80	203.3	203.3	1.00
-	WARREN	100	70	95	88.3	88.3	1.00
	TAP WATER	0		0	.0	.0	.00
	POTW INFLUENT	75	145	90	103.3	103.3	1.00